

Factory Overheads: Distribution

CONCEPT

Factory overhead costs are operating costs of a business enterprise which cannot be traced directly to a particular unit of output, i.e. product or jobs. Factory overhead is the aggregate of indirect materials, indirect wages and indirect expenses. The term "overhead" is used interchangeably with such terms as "burden", "supplementary costs", "indirect expense", "factory expense". The word "overhead" is more appropriate than burden and supplementary costs because the latter terms imply an unnecessary charge, an extra cost or an element of cost resulting from inefficiency. The term "overhead" is preferable to manufacturing expenses, because manufacturing expenses often refer to all manufacturing costs, both direct and indirect. Overhead may be used for all types of business enterprises while manufacturing expense is restricted in its use to manufacturing concerns.

FACTORY OVERHEAD—FIXED, SEMI-VARIABLE AND VARIABLE

Factory Overhead costs can be divided into fixed, semi-variable and variable costs. Fixed overhead costs are commonly described as those that do not vary in total amount with increases or decreases in productive activity or volume of output for a given period of time, usually, a year. Management salaries, building depreciation, rent, property taxes and amortisation of leaseholds are some examples of fixed overhead. Fixed costs are constant in total amount, but vary per unit as production activity changes.

Semi-variable or semi-fixed are those which remain fixed in total amount over a relatively short range of variation in output and then are abruptly changed to a new level, where they remain fixed in total amount for another short range of output. For example, if a third shift is added without increasing plant facilities, normally fixed costs, such as supervision salaries may be increased because of the necessity of night supervision, insurance premiums may be raised because of additional fire, theft, and accident risk, and some equipment rentals may be accelerated.

Variable costs include repairs, powers, workmen's compensation, supplies and indirect labour which are typical of cost varying in total amount, with changes in productive activity. The increase or decrease in variable overhead costs need not be in the same proportion to the change in output. However, in many

cases there is a directly proportional relationship. Variable costs per unit remain relatively constant with changes in production. Thus, variable costs fluctuate in total amount but tend to remain constant per unit as production activity changes. Variable overheads are generally considered controllable as they directly relate to the volume of output and by reducing the level of activity they can be reduced/avoided. Also, by comparing the actual variable overheads with budgeted variable overheads, such overheads can be controlled and kept within targets and tolerance limits.

FACTORY OVERHEADS—ACCOUNTING AND DISTRIBUTION

Factory Overheads by nature cannot be identified or associated directly with specific products or jobs. However, they should be included in total cost of products or jobs. The following steps are important in distribution of overhead costs among products or jobs.

1. Collection and codification
2. Allocation and apportionment
3. Absorption

COLLECTION AND CODIFICATION OF FACTORY OVERHEADS

The first step in distribution of factory overhead costs is their collection and codification under proper headings. Similar overhead cost items should be grouped together. The grouping of overhead costs is done through a technique known as “codification”. Codification is a method of identifying and describing various overhead expenses in numbers or letters or in a combination of both so that cost data can easily be collected. Codification of the entire items is done through a proper coding system. Following are briefly the objectives of codification:

1. To collect overhead items of similar nature.
2. To help in the allocation and apportionment of overhead costs to different departments or cost centres.
3. To make an analysis of overhead cost items for planning and control purposes.
4. To help in adopting a mechanised system of accounting.
5. To maintain a reasonable number of accounts which could be economical and useful.

Methods of Codification

Generally, the codification follows Standing Order Number or Cost Accounting Number. Standing Order Number covers production overhead items and Cost Accounting Number includes administration, selling and distribution overhead items. However, both follow the same principle of accumulating overhead cost items. Some important methods of codification are the following:

Serial Numbering System

Under this method each item is allotted a fixed number in serial order, e.g.,

- 01 Factory supplies
- 02 Indirect labour
- 03 Insurance
- 04 Factory rent

Number Blocks

Under this method, a block number is assigned to cover items of expenditure, e.g., 0.10 for maintenance expenses, 11-20 for supervision expenses, etc.

Combination of Alphabets and Numbers

Under this method a code is used which combines the number as well as the alphabets, e.g.,

- M_1 = Maintenance of plant
- M_2 = Maintenance of tools
- M_3 = Maintenance of factory building
- M_4 = Maintenance of office building

In the above example, M stands for maintenance and different numbers for different types of maintenance expenses.

Numerical Codes

Under this system, a code number usually consisting of nine digits is used. The first two digits signify whether the cost is fixed or variable, the next three indicate head of expense, the next two the analysis of expense for further subdivision, and the last two digits indicate the cost centre which incurs the expenditure, e.g.

10/121/05/08 Fixed/salary/officers/production.

Mnemonic Method

Under this method, the letters/alphabets are used to indicate an item such as D.P.T. for depreciation on plant and tools.

Among the above methods, the numerical code method is more suitable than the others for a large organisation. This method is easy to operate where a mechanical system of accounting is used. A large number of items could be covered under this method.

Sources of Overhead Collection

Different sources are available in an organisation to collect overhead expenses such as:

1. Store requisitions for items like indirect materials.
2. Financial accounts—A large number of items may be taken from the financial accounts of the business enterprise.
3. Wages book—Most indirect wages and labour-related costs.
4. Cash book—for indirect expenses.
5. Registers and reports—Plant and machinery register for depreciation, scrap, waste, spoilage can be discovered through investigation.

ALLOCATION AND APPORTIONMENT OF FACTORY OVERHEADS**Departmentalisation of Overhead**

Departmentalisation of factory overhead means dividing the company into segments called departments or cost centres where expenses are incurred. In a manufacturing concern, there are mainly two types of cost centres—producing departments and service departments. A production department represents a

subunit of the company where manufacturing activity takes place. Some typical examples of producing departments include assembly finishing, blending, painting and grinding departments. Service departments represent cost centres which provide support for the producing departments. Materials handling, personnel, plant maintenance, inspection, storage, purchasing, receiving, shipping, medical and other similar activities which are not directly involved in production are considered to be service activities.

Benefits of Departmentalisation

Departmentalisation serves two purposes: (i) closer control of factory overhead costs, and (ii) more accurate costing of jobs and products. Closer control is possible because departmentalisation makes the incurrence of costs in a department or cost centre, the responsibility of someone who heads the department or the cost centre.

More accurate costing of jobs and products is possible, if products are passed through more than one department. A job or product going through a department is charged with factory overhead for work done on that product in that department. Therefore, jobs or products are charged with different amounts of factory overhead depending on the number of departments through which they pass. This process results in accurate and reliable cost figures for the products or job.

Primary Distribution

Some factory overheads can be directly identified with a particular department or cost centre as having been incurred for that cost centre. Examples of such factory overheads are repairs and maintenance expenses incurred in specific departments, supervision, indirect labour, overtime, indirect materials and factory supplies, equipment depreciation.

Expenses such as power, light, rent, depreciation of factory building, expenses shared by all departments, cannot be charged directly to a department, be it producing or service. These expenses do not originate in any specific department. They are incurred for all and must, therefore, be apportioned or prorated to any or all departments using such items. Cost apportionment is the process of charging expenses in an equitable proportion to the various cost centres or departments. The Institute of Cost and Management Accountant (U.K.) defines cost apportionment, "as the allotment of proportions of items of cost to cost centres or cost units." The apportionment should be done on some rational and equitable bases. In cost accounting this is known as primary distribution of factory overhead.

It would be difficult to give a comprehensive list of the bases of apportionment, but the following bases are in common use:

1. Floor area occupied—overheads such as lighting and heating, rent and rates, depreciation on building, building repairs, caretaking, watching and patrolling.
2. Capital values—Depreciation on plant and machinery, insurance on building, and plant and machinery, maintenance of plant and machinery.
3. Direct labour hours and/or machine hours—Insurance on jigs, tools and fixtures, power, works management remuneration, repairs and maintenance cost.
4. Number of workers employed—Canteen, accident insurance, medical, dental and first aid, pensions, personnel department expenses, profit sharing payments, recreation, supervision, time office, wages department.
5. Technical estimate—Fire prevention, oil and grease, steam, water without meter.

Example 6.1

The Moden Company has four departments. A, B and C are the production departments and D is a servicing department. The actual cost for a period are as follows:

		Rs ('000)
<i>Indirect materials</i>		
Production department	A	950
	B	1,200
	C	200
Servicing department		1,500
<i>Indirect wages</i>		
Production department	A	900
	B	1,100
	C	300
Servicing department		1,000
Rent		2,000
Repair		1,200
Depreciation		900
Light		200
Supervision		3,000
Insurance		1,000
Employee's insurance (employer's liability)		300
Power		1,800

The following data also available in respect of four departments:

	<i>Departments</i>			
	A	B	C	D
Area (sq. ft)	150	110	90	50
No. of workers	24	16	12	8
Total wages ('000)	Rs 8,000	Rs 6,000	Rs 4,000	Rs 2,000
Value of plant ('000)	Rs 24,000	Rs 18,000	Rs 12,000	Rs 6,000
Value of stock ('000)	Rs 15,000	Rs 9,000	Rs 6,000	—

Apportion the above costs to the various departments on the most equitable method.

Solution

Departmental Distribution Summary

(Rs '000)

<i>Items</i>	<i>Basis</i>	<i>Total</i>	<i>Production departments</i>			<i>Sevicing deptts.</i>
			<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
Indirect material	Allocation	3,850	950	1,200	200	1,500
Indirect wages	Allocation	3,300	900	1,100	300	1,000
Rent	Area	2,000	750	550	450	250
Repairs	Plant value	1,200	480	360	240	120
Depreciation	Plant value	900	360	270	180	90
Light	Area	200	75	55	45	25

(Contd.)

Items	Basis	Total	Production departments			Serviceing depts.
			A	B	C	D
Supervision	No of workers	3,000	1,200	800	600	400
Insurance	Value of stock	1,000	500	300	200	—
Employees Insurance	Wages ✓	300	120	90	60	30
Power	Plant value	1,800	720	540	360	180
	Total	17,550	6,055	5,265	2,635	3,595

- Notes: (i) It has been assumed that insurance has been taken for stock.
 (ii) Power expenses have been apportioned on the basis of value of plant because no other information has been given.

Example 6.2

Selfhelp Ltd. has gensets and produces its own power. Data for power costs are as follows:

Horse Power Hours	Production depts.		Service depts.	
	A	B	X	Y
Needed capacity production	10,000	20,000	12,000	8,000
Used during the month of May	8,000	13,000	7,000	6,000

During the month of May, costs for generating power amounted to Rs 9,30,000; of this Rs 2,50,000 was considered to be fixed cost. Service Dept X renders service to A, B and Y in the ratio 13:6:1, while Y renders service to A and B in the ratio 3:1. Given that the direct labour hours in Depts A and B are 1,650 hours and 2,175 hours respectively, find the power cost per labour hour in each of these two Depts.

Solution

Selfhelp Ltd. Overheads Distribution Summary

Particulars	Basis of charge	Total Rs	Production depts.		Service depts.	
			A	B	X	Y
(1)	(2)	(3)	Rs (4)	Rs (5)	Rs (6)	Rs (7)
Fixed Cost	H.P. Hours needed at capacity production (5:10:6:4)	2,50,000	50,000	1,00,000	60,000	40,000
Variable Cost	H.P. hours used (8:13:7:6)	6,80,000	1,60,000	2,60,000	1,40,000	1,20,000
Total overheads		9,30,000	2,10,000	3,60,000	2,00,000	1,60,000
Service Dept.			1,30,000	60,000	- 2,00,000	10,000
X overheads apportioned to A, B and Y (13:6:1)						

(Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Service Deptt. Y overheads apportioned to A and B (31:3)			1,55,000	15000		-1,70,000
Total overheads of production Deptts.			4,95,000	4,35,000	—	—
Labour hours worked			1,650	2,175		
Power cost per labour hour			300	200		

Apportionment of Service Departments Overheads To producing Departments

Secondary Distribution

The primary distribution of factory overhead apportions all overhead costs to the different departments or cost centres—production and service departments both. However, it is necessary that overhead costs of service departments (accumulated through direct allocation or primary distribution) should be further assigned to producing departments. This is due to the reason that service departments do not themselves manufacture anything and it is the production departments or cost centres which are involved in manufacturing activities. The reassignment or reapportionment of service departments overhead to producing departments or centres is termed as secondary distribution.

Secondary distribution is useful in the following manner:

1. It helps in determining the cost of products or jobs sold and value of inventory.
2. It helps in determining the effect of various managerial decisions and actions on the total cost of the business firm. For example, decisions as to add or to drop a product line require information about its cost effect, which can be estimated after secondary distribution has been made.
3. It helps subsequently in determining the price of the product or job. In case of contracts based on cost in place of market price, secondary distribution helps in fixing a selling price which is advantageous to the parties concerned.
4. It promotes motivation among employees of the producing departments to take up service department activities.

Bases for Secondary Distribution

It is difficult to suggest a sample list of service departments and equitable bases of distribution of overhead costs. The general basis for apportioning service departments' overheads to producing departments are the following:

1. Services rendered (benefits obtained)—This is perhaps the most popular method of apportioning service department costs. The services rendered to different departments, i.e., benefits obtained by them can be a suitable basis. If a producing department has received large benefits, it must be charged for a share of overhead costs incurred to provide that quantity of benefits. This method is simple and economical.

2. *Ability to pay*—This method suggests that a large share of servicing departments overhead costs should be assigned to those producing departments whose product contributes the most to the income of a business enterprise. However, it is difficult to measure the “ability to pay” of different departments and this method is also not based on equity.
3. *Survey or analysis*—This method is applied where a suitable base is difficult to find or it would be too costly to select a method which is considered suitable. For example, the postage cost could be apportioned on a survey of postage used during a year.
4. *Efficiency or incentives*—This method uses standards and budgets and apportions the overhead costs on the basis of a present budget or standard. Sometimes, this method is used along with the bases of services rendered or ability to pay method.

In selecting a suitable base for apportioning service department overheads, considerations should be given to practicability, simplicity, economy, theoretical soundness and assistance in accurate costing and cost control.

The following list gives a few service departments and bases commonly used to apportion the respective overhead costs:

<i>Service Department</i>	<i>Apportionment Base</i>
Personnel	Number of employees, labour hours, labour cost.
Purchasing	Number of orders, cost of materials.
Receiving	Cost of materials, number of units, number of orders.
Stores	Cost of materials, number of requisitions filled, number of units handled.
Factory Office	Number of employees, labour hours, labour cost.
Machine Maintenance and Repair	Machine hours, labour hours, labour cost, services rendered.
Engineering	Machine hours, labour hours, service rendered.
Payroll or Time-keeping Department	Total labour or machine hours or number of employees in each department.
Welfare, Canteen Recreation, Medical	Number of employees in each department.
Building Service Department	Relative area of each department.
Internal Transport Service	Weight, value, graded products, weight and distance.

Inter-departmental Services

While apportioning service departments overheads, one may notice two situations: (i) The entire amount of a servicing department is to be distributed to only the producing departments. This does not involve any practical difficulty and provides the simplest and quickest method for apportioning costs of the servicing department. (ii) Services provided by some servicing departments are used partly by other servicing departments. That is, many service departments serve each other. For example, the payroll department in a firm prepares payroll for the entire organisation, but it depends on the building maintenance department for repair and maintenance services. Similarly, the building maintenance department provides services for all departments using the building, but it gets service from departments like stores, factory office, and personnel. This second situation is known as inter-departmental services.

Methods

There are mainly two methods of dealing with inter-departmental service:

A. *Continuous apportionment*: In this method, the process of apportioning service departments overhead is continued until the figures become immaterial or totally exhausted. The following steps are involved in this method:

- Use the given percentages to apportion the original total of the first service department. This closes the account of the first service department and transfers prorated amounts to other departments.
- Use the given percentages of second service department whose total is made up of original amount plus prorated amount of service department first. This closes the account of second service department and assigns prorated amounts to the other departments including service department first also.
- Follow the same procedure to all other service departments.
- Repeat a second cycle of apportionment starting with the service department first, whose total consists, at present, only of amounts prorated from other service departments. In this way, the service department totals become less and less with each cycle of apportionment because each time a substantial amount is apportioned to the producing departments.
- Stop the above cycle at any point where it is found that the remaining figure (to be apportioned) are too small to be of any consequence or when the figures are totally exhausted.

Example 6.3

The overhead of a manufacturing company has been analysed to the point of primary distribution.

		Rs
Production departments:	Machine	10,00,000
	Assembly	4,00,000
Service departments:	Canteen	2,00,000
	Powerhouse	3,00,000

The canteen is to be apportioned on the basis of employees:

	Employees	%
Machine	240	60
Assembly	140	35
Powerhouse	20	5
	400	100

The powerhouse is to be apportioned on the basis of electricity used:

	Thousand kilowatts	%
Machine	270	75
Assembly	36	10
Canteen	54	15
	360	100

Solution The apportionment would be done in the following manner:

	Machine	Assembly	Canteen	Powerhouse
Primary apportionment	10,00,000	4,00,000	2,00,000	3,00,000
Apportion: Canteen	1,20,000	70,000	- 2,00,000	10,000
Powerhouse	2,32,500	31,000	46,500	- 3,10,000
Canteen	27,900	16,300	- 46,500	2,300
Powerhouse	1,800	200	300	- 2,300
Canteen	200	100	- 300	
Total Service Deptts.	3,82,400	1,17,600		
Total Production Overhead	13,82,400	5,17,600		

B. Algebraic method or simultaneous equation This method helps in finding out the amount of overhead of each servicing department by solving simultaneous equations. The total expenses of service departments can be directly transferred to production departments.

Example 6.4

A company has three production departments, A, B and C and two service departments, P and Q. The following figures are available as per departmental distribution summary:

		Rs
Production departments	A	3,150
	B	3,700
	C	1,400
Service departments	P	2,250
	Q	1,000

The expenses of the service departments are to be apportioned on a percentage basis as follows:

		A	B	C	P	Q
Service deptt.	P	40%	30%	20%	—	10%
Service deptt.	Q	30%	30%	20%	20%	—

Solution

Let X = total overhead of deptt. P

Y = total overhead of deptt. Q

Therefore $X = 2,250 + \frac{20}{100} Y$ (1)

$Y = 1,000 + \frac{10}{100} X$ (2)

$10X = 22,500 + 2Y$ (3)

$10Y = 10,000 + 1X$ (4)

Multiplying equation (3) by 5

$50X - 10Y = 1,12,500$ (5)

$- X + 10Y = 10,000$ (6)

Adding $49X = 1,22,500$

$X = 2,500$

and $Y = 1,250$

Secondary Distribution Summary

	Total Rs	Production Department			Servicing Dept.	
		A Rs	B Rs	C Rs	P Rs	Q Rs
As per summary	11,500	3,150	3,700	1,400	2,250	1,000
Service deptt. P		1,000	750	500	- 2,250	250
	11,500	4,150	4,450	1,900		- 1,250
Service deptt. Q		375	375	250	250	- 1,250
	11,500	4,525	4,825	2,150	—	—

Service departments' overheads represent the sum of the service department cost plus the costs apportioned from other service departments. After obtaining total overhead cost of servicing departments, the total of each service department is apportioned to producing departments on the basis of percentage or proportion (for the services rendered) of the specific producing departments.

Example 6.5

A factory is having three production departments A, B and C and two service departments—Boiler-House and Pump-Room. The boiler-house has to depend upon the pump-room for supply of water and pump-room in its turn is dependent on the boiler-house for supply of driving the pump. The expenses incurred by the production departments during a period are: A, Rs 8,00,000; B, Rs 7,00,000; and C, Rs 5,00,000. The expenses for boiler-house are Rs 2,34,000 and the pumproom are Rs 3,00,000.

The expenses of the boiler-house and pump-room are apportioned to the production departments on the following basis:

	A	B	C	B.H.	P.R.
Expenses of boiler-house	30%	40%	30%	—	10%
Expenses of pump-room	40%	20%	20%	20%	—

Show clearly as to how the expenses of boiler-house and pump-room would be apportioned to A, B and C departments. Use algebraical equation. (CS Final)

Solution

Let X be the overhead of boiler-house and Y be the total overhead of pump-room.

$$X = 2,34,000 + .2Y$$

$$Y = 3,00,000 + .1X$$

$$10X - 2Y = 23,40,000 \quad (i)$$

$$-X + 10Y = 30,00,000 \quad (ii)$$

On multiplying Equation (i) by 5 and adding it to Equation (ii)

$$50X - 10Y = 1,17,00,000$$

$$-X + 10Y = 30,00,000$$

$$\hline 49X = 1,47,00,000$$

$$X = 3,00,000$$

On substituting this value in Equation (ii)

$$-3,00,000 + 10Y = 30,00,000$$

$$10Y = 33,00,000$$

$$Y = 3,30,000$$

Distribution of Overheads

	Total		Departments		
	Rs	A Rs	B Rs	C Rs	
Amount for the Departments	20,00,000	8,00,000	7,00,000	5,00,000	
Boiler-house	2,70,000 *	60,000	1,20,000	90,000	
Pump-room	2,64,000 **	1,32,000	66,000	66,000	
	25,34,000	9,92,000	8,86,000	6,56,000	

* Rs 3,00,000 less 1/10 for the Pumproom

** Rs 3,30,000 less 1/5 for the Boilerhouse

Example 6.6 ✱

A company has 3 production departments A, B and C and two service departments X and Y. The following data are extracted from the records of the company for a particular given period:

	Rs.
(i) Rent and rates	25,000
(ii) General lighting	3,000
(iii) Indirect Wages	7,500
(iv) Power	7,500
(v) Depreciation on machinery	50,000
(vi) Sundries	50,000

Additional Data, Departmentwise

	Total	Departments				
		A	B	C	X	Y
Direct wages (Rs)	50,000	15,000	10,000	15,000	7,500	2,500
Horsepower of machines used	150	60	30	50	10	—
Cost of machinery (Rs)	12,50,000	3,00,000	4,00,000	5,00,000	25,000	25,000
Production hours worked	—	6,226	4,028	4,066	—	—
Floor space used (Sq. mtr.)	10,000	2,000	2,500	3,000	2,000	500
Lighting points (nos.)	60	10	15	20	10	5

Service Departments' Expenses Allocation

Departments	A	B	C	X	Y
X	20%	30%	40%	—	10%
Y	40%	20%	30%	10%	—

You are required to:

- compute the overhead rate of production departments using the repeated distribution method; and
- hence, determine the total cost of a product whose direct material cost and direct labour cost are respectively Rs 250 and Rs 150 and which would consume 4 hours, 5 hours and 3 hours in departments A, B and C respectively.

(ICWA Inter, June 1997, B.com. (Hons), Delhi)

Solution

Overheads Distribution Summary

Items	Basis of apportionment	Total Rs	Production Depts.			Service Depts.	
			A Rs	B Rs	C Rs	X Rs	Y Rs
Primary Distribution							
Direct wages	Actual (only service depts.)	10,000	—	—	—	7,500	2,500
Rent and Rates	Floor space @ Rs 2.50 per sq. m.	25,000	5,000	6,250	7,500	5,000	1,250
General Lighting	Lighting points @ Rs 50 per point	3,000	500	750	1,000	500	250
Indirect Wages	Direct wages (15%)	7,500	2,250	1,500	2,250	1,125	375
Power	Horse power @ Rs 50	7,500	3,000	1,500	2,500	500	—
Depreciation on Machinery	Cost of Machinery 4% of cost of mach.	50,000	12,000	16,000	20,000	1,000	1,000
Sundries	Direct wages @ Re 1.	50,000	15,000	10,000	15,000	7,500	2,500
	Total	1,53,000	37,750	36,000	48,250	23,125	7,875
Secondary Distribution							
Service Dept. X overheads apportioned to Depts. A, B, C & Y in (20 : 30 : 40 : 10)			4,625	6,937	9,250	(23,125)	2,313
Service Dept. Y overheads apportioned to Depts. A, B, C & X in (40 : 20 : 30 : 10)			4,075	2,038	3,056	1,019	(10,188)
Service Dept. X overheads apportioned to Depts. A, B, C & Y in the given proportion			204	306	407	(1,019)	102
Service Dept. Y overheads apportioned to Depts. A, B, C & X in the given proportion			41	20	31	10	(102)
Service Dept. X overheads apportioned to Depts. A, B, C, & Y in the given proportion			2	3	5	(10)	
(1) Total Overheads		1,53,000	46,697	45,304	60,999	23,125	7,875
(2) Production hours (worked)			6,226	4,028	4,066		
(3) Overhead Rate 1-2 (Rs.)			7.50	11.25	15.00		

The Overhead Rates (per hour) for Production depts. A, B, and C are as under:

Departments	Rate per hour (Rs)
A	7.50
B	11.25
C	15.00

Statement of Total Cost of a Product

Particulars	Rs
Direct Material (given)	250.00
Direct Labour (given)	150.00

400.00

(Contd.)

Prime Cost Overheads Cost Depts.	Hours Consumed	Rate	Rs	
A	4	7.50	=	30.00
B	5	11.25	=	56.25
C	3	15.00	=	45.00
				<u>131.25</u>
Total Cost of Production				531.25

Example 6.7

A company has two production departments and two service departments. The data relating to a period are as under:

Particulars		Production Departments		Service Departments	
		PD ₁	PD ₂	SD ₁	SD ₂
Direct Materials	(Rs)	80,000	40,000	10,000	20,000
Direct Wages	(Rs)	95,000	50,000	20,000	10,000
Overheads	(Rs)	80,000	50,000	30,000	20,000
Power Requirement at normal capacity operations	(Kwh)	20,000	35,000	12,500	17,500
Actual Power Consumption during the period	(Kwh)	13,000	23,000	10,250	10,000

The power requirement of these departments are met by a power generation plant. The said plant incurred an expenditure, which is not included above, of Rs. 1,21,875 out of which a sum of Rs 84,375 was variable and the rest fixed.

After apportionment of power generation plant costs to the four departments, the service department overheads are to be redistributed on the following bases:

Same Deptts.	PD ₁	PD ₂	SD ₁	SD ₂
SD ₁	50%	40%	—	10%
SD ₂	60%	20%	20%	—

You are required to:

- Apportion the power generation plant costs to the four departments.
- Re-apportion service department cost to production departments.
- Calculate the overhead rate per direct labour hour of production departments, given that the direct wages rates of PD₁ and PD₂ are Rs 5 and Rs 4 per hour respectively.

(CA Inter, Nov. 1996)

Solution

(i) Statement of Apportionment of Power Generation Plant Costs

Particulars	Total Cost	Basis of Apportionment	Production Departments		Service Departments	
			PD ₁	PD ₂	SD ₁	SD ₂
	Rs		Rs	Rs	Rs	Rs
Fixed Expenditure	37,500	Normal Capacity (kwh) {4:7:2.5:3.5}	8,824	15,441	5,515	7,720

(Contd.)

Variable Expenditure	84,375	Actual Power consumption (kwh) {13:23:10.25:10}	19,500	34,500	15,375	15,000
Total	1,21,875		28,324	49,941	20,890	22,720
Overheads Summary:						
Direct Material	30,000		—	—	10,000	20,000
Direct Wages	30,000		—	—	20,000	10,000
Overheads	1,80,000		80,000	50,000	30,000	20,000
Total	3,61,875		1,08,324	99,941	80,890	72,720

**(ii) Statement of Reapportionment of Service Deptts. Cost to Production Deptts.
(Repeated Distribution Method)**

Particulars	Total	Production Departments		Service Departments	
		PD ₁ Rs	PD ₂ Rs	SD ₁ Rs	SD ₂ Rs
Total Overheads	3,61,875	1,08,324	99,941	80,890	72,720
Dept. SD ₁ Overheads apportioned in the ratio [50 : 40 : - : 10]	80,890	40,445	32,356	- 80,890	8,089
Dept. SD ₂ Overheads apportioned in the ratio [60 : 20 : 20 : - 1]	80,809	48,485	16,162	- 16,162	80,809
Dept. SD ₁ Overheads apportioned in the ratio [50 : 40 : - : 10]	16,162	8,081	6,465	- 16,162	1,616
Dept. SD ₂ Overheads apportioned in the ratio [60 : 20 : 20 -]	1,616	970	323	323	- 1,616
Dept. SD ₁ Overheads apportioned in the ratio [50 : 40 : - : 10]	323	162	129	- 323	32
Dept. SD ₂ Overheads apportioned in the ratio [60 : 20 : 20-1]	32	19.20	6.40	6.40	- 32
Dept. SD ₁ Overheads apportioned in the ratio [50 : 40 : - : 10]	6.40	3.20	2.56	- 6.40	0.64
Dept. SD ₂ Overheads apportioned in the ratio [60 : 20 : 20-1]	0.64	0.38	0.13	0.13	0.64
Total	2,06,489.78	1,55,385.09	0.13	00	00

(iii) Computation of Overhead Rates Per Direct Labour Hour of Production Departments

Particulars	Production Departments	
	PD ₁	PD ₂
Total Direct Wages (Rs) : (A)	95,000	50,000
Direct Wages rate per hour (Rs) : (B)	5	4
Direct Labour Hours (A/B) = (C)	19,000	12,500
Overheads (Rs) : (D)	2,06,489.78	1,55,385.09
Overhead Rate Per Direct Labour Hour (Rs): (D)/(C)	10.87	12.43

Example 6.8

A factory has three production departments (P_1 , P_2 and P_3) and two service departments (S_1 and S_2). Budgeted overheads for the next year have been allocated/apportioned by the cost department among the five departments. The secondary distribution of service department overheads is pending and the following details are given to you:

Department	Overheads apportioned/ allocated to activity	Estimated level
P_1	Rs 48,000	5,000 labour hours
P_2	Rs 1,12,000	12,000 machine hours
P_3	Rs 52,000	6,000 labour hours
		Apportionment of service department costs
S_1	Rs 16,000	P_1 (20%), P_2 (40%), P_3 (20%), S_2 (20%)
S_2	Rs 24,000	P_1 (10%), P_2 (60%), P_3 (20%), S_1 (10%)

Calculate the overhead rate of each production department after completing the distribution of service department costs.

(ICWA Inter, June 1998)

Solution

Let x be the total overhead costs S_1 and y that of S_2 . Then we get the simultaneous equations:

$$x = 16,000 + 0.1y$$

$$y = 24,000 + 0.2x$$

Solving these equations we get $x = 18,775$

$$y = 27,755$$

The distribution/apportionment of overheads among the three production departments would be as under:

Overheads Distribution Summary

Particulars	P_1	P_2	P_3
	Rs	Rs	Rs
Direct allocation	48,000	1,12,000	52,000
Apportionment of Overhead Cost of S_1	(20%) 3,755	(40%) 7,510	(20%) 3,755
Apportionment of Overhead Cost of S_2	(10%) 2,776	(60%) 16,653	(20%) 5,551
Total:	54,531	1,36,163	61,306
Budgeted Capacity	5,000	12,000	6,000
	labour hrs.	machine hrs.	labour hrs.
Overhead Cost per hour	Rs 10.91	Rs 11.35	Rs 10.22

ABSORPTION OF FACTORY OVERHEADS

Meaning of Absorption

After all service departments overheads have been apportioned to producing departments, the next step is to spread factory overhead to different products or jobs produced. This is termed as “overhead absorption” in cost accounting. The Institute of Cost and Management Accountants (U.K.) define overhead absorption as “the allotment of overhead to cost units.” Known by different names, such as recovery, overhead application, overhead costing, levy, burden rate, etc. the term “absorption” implies that expenses pertaining to a producing department or cost centre are, finally charged to or absorbed in the cost of products, jobs, etc. passing through it. As a result of absorption, the cost of each unit of product of the producing departments includes an equitable share of the total overhead of that department.

Methods of Absorption

Some method of overhead absorption has to be applied to absorb factory overhead to individual products or jobs, etc. on some equitable basis. The rate which is used to charge overhead cost to the products or jobs is known as absorption rate. The following are the generally recognised methods of absorption or absorption rates:

Percentage on Direct Materials

An absorption rate based on materials cost is obtained by dividing total estimated factory overhead by total direct materials cost expected to be used in the manufacturing process. If factory overhead is Rs 3,00,000 and materials cost is Rs 2,50,000, the absorption rate will be:

$$\frac{3,00,000}{2,50,000} \times 100 = 120\%$$

Each job or product would be charged on the basis of 120% absorption rate. For example, if the materials cost of product is Rs 50,000, the factory overhead to be charged for their product would be Rs 60,000 ($50,000 \times 120\%$).

Advantages The “percentage on direct material cost” method is simple and easy to understand and apply. This method will give correct overhead cost figure where the prices of raw materials do not differ significantly, where quantity and cost of materials in each product are uniform, and where processing for the different products is also uniform. It is useful in very simple types of small business firms.

Disadvantages This method has the following disadvantages:

1. There is no logical relationship between material cost of a product and factory overhead used in production.
2. Materials prices are subject to fluctuations quite often and this phenomenon leads to high or low overhead costs, even though overhead figures remain unchanged.
3. Most of the overhead expenses vary with time. For example, a product or job using cheap materials but a longer period of processing should bear more for overhead as compared to a job or product which uses expensive materials but a shorter period of processing. But the use of direct material cost totally ignores the time factor which is an important factor in allocation/apportionment of overhead costs.
4. This method is not proper where part of the materials passes through all processes, and part through only some processes.

5. The mere fact that a job consumes material of a very expensive nature does not imply that the overhead incurred on that job will also be heavier. If the materials cost basis is used to charge overhead, the product using expensive materials will, in this case, be charged with more than its share of overhead.

Percentage on Direct Wages

Percentage on Direct Wages is computed in the following manner:

$$\frac{\text{Factory overhead}}{\text{Direct labour cost}} \times 100$$

If factory overhead is Rs 2,00,000 and the direct labour cost is also Rs 2,00,000 then absorption rate based on direct wages will be 100%.

A job or a product with a direct labour cost of Rs 30,000 would be charged with Rs 30,000 for factory overhead.

Advantages This method has the following advantages:

1. It is simple to operate and understand.
2. It considers the time factor, as labour cost is computed by multiplying number of hours spent on work by an hourly labour rate. The more hours worked, the higher the labour-cost and the greater the use and therefore the charge for factory overhead.
3. Labour rates fluctuate, but less frequently than that of prices of materials.

Disadvantages The disadvantages are:

1. It depends on cost of direct labour which may not reflect accurately the contribution of factory overhead in the cost of product. Many expenses such as taxes, property insurance, depreciation are functions of time.

2. It does not take into account variations, if any, in the rates of remuneration for different types of labour and therefore, the wages incurred on different jobs are not necessarily in the same ratio as the hours spent. This fact would be clear where workers are paid on a piece-rate basis as in this system wages depend on output and not upon time. This limitation is clear from the following example.

	Job A (16 hr)	Job B (20 hr)
Direct materials	600	600
Direct labour	400	400
Prime cost	1000	1000
Factory overhead (75% on direct wages)	300	300
Factory cost	1300	1300

As job B has taken 25% extra time to complete work than A, the job carried out by B must have occupied the factory for a longer period than A's, but as is clear from the above statement, the charge for factory overhead is the same in each case.

4. Total direct labour cost represents the sum of high and low-wage production workers. By applying overhead on the basis of direct labour cost, a job or product is charged with more overhead when a high rate operator performs work instead of a low-rate worker leading to incorrect distribution of factory overhead.

Prime Cost Percentage

The prime cost basis combines the total of direct materials cost and direct labour cost and uses this total as a basis for charging overhead. The formula used in determining the rate is:

$$\frac{\text{Factory overhead}}{\text{Prime cost}} \times 100$$

If in a case the factory overhead is Rs 4,56,000 and prime cost is Rs 6,00,000, then prime cost percentage rate will be

$$\frac{4,56,000}{6,00,000} \times 100 = 76\% \text{ of prime cost}$$

Advantages This method is simple to operate. It considers both materials and labour in charging overhead to each job or product. The prime cost data is easily available without any additional problem of accumulation.

Disadvantages The disadvantages are:

1. Two items, i.e., materials and labour both of which possess many disadvantages influence the charging of factory overhead to jobs and products.
2. Where the cost of materials is a larger part of the prime cost, the time factor (direct labour costs) will be ignored which is more related to the factory overhead.
3. It ignores time factor in absorbing factory overhead.
4. It can be useful to only a few departments where the type of labour and value of materials used are constant.

The following example illustrates the demerits of this method.

	<i>Job A</i>	<i>Job B</i>
Direct materials	Rs 30,000	Rs 4,000
Direct wages (Job A 50 hours @ Rs 4 per hour and Job B 200 hours @ Rs 4 per hour)	200	800
Prime cost	Rs 30,200	Rs 4800
Factory overhead (50% on prime cost)	15,100	2400
Factory cost	45,300	7200

The above example indicates that the labour expended on job B is four times that of job A. But this fact is not reflected in the factory overhead charged to these two jobs.

Unit of Production Basis

The unit of production method is the simplest and most direct method of charging factory overhead. The unit might be a kilo, foot, a machine, a hundred pieces or whatever unit of measure is used for the product. As a formula, the computation is as follows:

$$\frac{\text{Factory overhead}}{\text{Units of production}}$$

If factory overhead is Rs 3,00,000 and the company intends to produce 2,50,000 units during the next period, each unit completed would be charged with Rs 1.20 (3,00,000 ÷ 2,50,000 units) as its share of

factory overhead. Thus, an order with 1,000 completed units would be charged Rs 1,200 (1,000 units × Rs 1.20) for factory overhead.

The usefulness of this method is limited normally to those situations where only one product is produced. It is used most satisfactorily in small manufacturing concerns having relatively simple manufacturing processes or in large concerns manufacturing few articles in large quantities. If several products manufactured are alike or closely related, absorption of factory overhead can be made on a weight or a point basis, such as in the following example:

Points value of Product A	5 points
Points value of Product B	7 points
Production units A 4000, B 5000.	
Overhead to be absorbed Rs 5,50,000	

$$\text{Rate per unit} = \frac{5,50,000}{(4000 \times 5) + (5,000 \times 7)} = \text{Rs. } 10$$

Rate per unit of A = 5 × Rs 10 = Rs 50

Rate per unit of B = 7 × Rs 10 = Rs 70

Labour Hour/Production Hour Rate

One of the most widely used methods for overhead application is the labour hour basis. Since many companies require direct labour workers to record their time spent on each job, or in each department of a process cost factory, the data for absorption of overhead on this basis is readily available. The equation for determining the overhead rate under this method is:

$$\frac{\text{Factory overhead}}{\text{Direct labour hours}}$$

If factory overhead is Rs 4,00,000 and direct labour hours are 2,00,000, then overhead rate based on direct labour hours would be Rs 2 per hour of direct labour (Rs 4,00,000 ÷ 2,00,000 hours). A product that requires 5,000 direct labour hours would be charged with Rs 10,000 (5,000 hours × Rs 2) for factory overhead.

Advantages The following are the advantages:

1. As long as direct labour is the chief factor in manufacturing processes, the direct labour hours method is useful as the most equitable basis for charging overhead.
2. This method uses the time factor and production taking the same time is charged with the same amount of overhead, though the direct labourer may be getting different wage rates.

Disadvantages The disadvantages are:

1. The method requires accumulation of direct labour hours by job, product or department. Time-keeping should be adequate to provide this information.
2. This method cannot be used where machines are used extensively for production.

Machine Hours Rate

The machine hour rate is used where the work is performed primarily on machines. The formula used in computing the rate is:

$$\frac{\text{Factory overhead}}{\text{Machine hours}}$$

If factory overhead is Rs 3,00,000 and total machine hours are 1,50,000, the machine hour rate is Rs 2 per machine hour (Rs 3,00,000 ÷ 1,50,000 hours).

Advantages This method can be used advantageously where the machine is the major factor in production. In capital-intensive industries, plans and machines are used in large quantities and one operator may attend to several machines or several operators may attend to a single machine. By making the machine the basis, overhead costs can be equitably absorbed among different products.

Disadvantages The disadvantages are:

1. Machine hour data has to be collected and therefore it requires additional clerical work. The cost of collection and accounting activities goes up and therefore, is not workable for small business firms.
2. The method cannot be used universally by all business concerns. It can be used where production is mainly through machines.

Types of Machine Hour Rate

Two types of machine hour rate may be calculated such as:

1. **Ordinary machine hour rate**—This rate takes into account only those overhead expenses which are directly attributed to the running of a machine. Such expenses are power, fuel, repair, maintenance and depreciation. The total of all these expenses is divided by the total machine hours.
2. **Composite machine hour rate**—This method takes into account not only expenses directly connected with the machine as mentioned above, but also other expenses which are known as standing or fixed charges. Such expenses are rent and rates, supervisory, labour, lighting and heating, etc. These expenses being fixed in nature are determined for a particular period and then apportioned among different departments on some equitable bases. The overhead expenses thus apportioned to each department are further apportioned among the machines (machine cost centres) in that department, on an equitable basis. Generally composite machine hour rate is calculated.

The following are bases used for the apportionment of expenses for computing machine hour rate.

<i>Overhead expenses</i>	<i>Basis</i>
1. Standing Charges	
(i) Supervision	Estimated time devoted to each machine
(ii) Rent and rates	Floor area occupied by each machine
(iii) Heating and lighting	Number of points or floor occupied by each machine
(iv) Lubricating oil and consumable stores	Capital values, machine hours or past experience
(v) Insurance	Insured value of each machine
(vi) Miscellaneous expenses	Equitable basis depending on facts
2. Machine or Variable Expenses	
(i) Depreciation	Machine hours
(ii) Repairs	Machine hours or capital values or cost of repairs spread over the working life of machine
(iii) Power	Horse power of machines or machine hours or meter readings

SELECTING AN ABSORPTION RATE

The above absorption rates have their own merits and demerits. The method to be used depends on the factors and circumstances prevailing in a manufacturing firm. Whatever method is selected by a firm, it must achieve the following objectives:

1. The basic objective is to select an absorption rate which helps in determining the accurate amount of factory overhead to be charged to individual products, jobs, processes, etc.
2. A secondary objective in selecting a method of absorption is to minimise clerical effort and cost. When two or more absorption rates tend to charge the same amount of overhead, the simplest base could be used.
3. The selection of an absorption rate is also influenced by other factors, such as type of industry, legal requirements, if any, policy of management, etc. in addition to the suitability of a method under specific circumstances.

Example 6.12

The production department of a factory furnishes the following information for the month of October:

Materials used	Rs 54,000	
Direct wages	Rs 45,000	
Overhead	Rs 36,000	
Labour hours worked		36,000
Hours of machine operation		30,000

For an order executed by the department during the period, the relevant information was as under:

Materials used	Rs 6,00,000	
Direct wages	Rs 3,20,000	
Labour hours worked		3,200
Hours of machine operation		2,400

Calculate the overhead charges chargeable to the job by the following methods; (i) Direct materials cost percentage rate, (ii) Labour hour rate, and (iii) Machine hours rate. (CA Inter)

Solution

(i) Direct materials cost percentage rate:

$$\frac{\text{Overhead}}{\text{Direct materials}} \times 100 = \frac{36,000}{54,000} \times 100 = 66.67\%$$

Materials used on the order Rs 6,00,000

Overhead @ 66.67% = Rs 4,00,000

(ii) Labour hours rate:

$$\frac{\text{Overhead}}{\text{Labour hours}} = \frac{36,000}{36,000} = \text{Re } 1$$

Overhead @ Re 1 for 3,200 hours = Rs 3,200

(iii) Machine hours rate:

$$\frac{\text{Overheads}}{\text{Machine hours}} = \frac{36,000}{30,000} = \text{Rs } 1.20$$

Overheads @ Rs 1.20 for 2,400 hours = Rs 2,880

Example 6.13

Atlas Engineering Ltd. accepts a variety of jobs which require both manual and machine operations. The budgeted Profit and Loss Account for the period 1996-97 is as follows:

		(In lakhs of rupees)
Sales		75
Less: Cost of Sales		
Direct Materials	10	
Direct Labour	5	
<i>Prime Cost</i>	<u>15</u>	
Production Overhead	30	
<i>Production Cost</i>	<u>45</u>	
Administrative, Selling and Distribution Overhead	15	60
<i>Profit</i>		<u>15</u>

Other Budgeted Data

Labour hours for the period	2,500
Machine hours for the period	1,500
No. of jobs for the period	<u>300</u>

An enquiry has been received recently from a customer and the production department has prepared the following estimate of the prime cost required for the job:

	Rs
Direct material	2,500
Direct labour	2,000
Prime Cost	<u>4,500</u>
Labour hours required	= 80
Machine hours required	= 50

You are required to:

- Calculate by different methods, six overhead absorption rates for absorption of production overhead and comment on the suitability of each.
- Calculate the production overhead cost of the order based on each of the above rates.
- Give your recommendation to the company.

(ICWA Inter, Dec. 1997)

(a) Atlas Engineering Ltd.
**Computation of Overhead Absorption Rates for Absorption
of Production Overheads**

Sl. No.	Methods of Absorption	Formula	Overhead Absorption Rate
1.	Direct Labour Hour Rate	$\frac{\text{Production Ovhds.}}{\text{Direct Labour Hrs.}} = \frac{\text{Rs } 30,00,000}{2,500 \text{ hrs.}}$	= Rs 120
2.	Machine Hour Rate	$\frac{\text{Production Ovhds.}}{\text{Machine Hrs.}} = \frac{\text{Rs } 30,00,000}{1,500 \text{ hrs.}}$	= Rs 200
3.	Percentage of Direct Material Cost	$\frac{\text{Production Ovhds.}}{\text{Direct Material cost}} = \frac{\text{Rs } 30,00,000}{\text{Rs } 10,00,000} \times 100$	= 300%
4.	Percentage of Direct Wages Cost	$\frac{\text{Production Ovhds.}}{\text{Direct Labour cost}} = \frac{\text{Rs } 30,00,000}{\text{Rs } 5,00,000} \times 100$	= 600%
5.	Percentage of Prime Cost	$\frac{\text{Production Ovhds.}}{\text{Prime cost}} = \frac{\text{Rs } 30,00,000}{\text{Rs } 15,00,000} \times 100$	= 200%
6.	Job Rate	$\frac{\text{Production Ovhds.}}{\text{No. of Jobs}} = \frac{\text{Rs } 30,00,000}{300}$	= Rs 10,000

**(b) Statement of Production Overhead Cost for the Job
(Under Different Methods)**

Methods	Production Overhead Cost for the job Rs
1. Direct Labour Hour Rate	80 hrs \times 120 = 9,600
2. Machine Hour Rate	50 hrs \times 200 = 10,000
3. Percentage of Direct Material Cost	300% of Rs 2,500 = 7,500
4. Percentage of Direct Labour Cost	600% of Rs 2,000 = 12,000
5. Percentage of Prime Cost	200% of Rs 4,500 = 9,000
6. Job Rate	1 \times Rs 10,000 = 10,000

Comments

- Labour Hour Rate and Machine Hour Rate both are based on time. They are generally preferred since most overheads vary with time.
- Direct Material Cost Percentage Method is suitable only if all the jobs use the same materials and labour, and machine time does not vary significantly.
- Direct Labour Cost Percentage method may be used if the labour rates for different jobs do not vary much.
- Percentage of Prime Cost is simple but has the disadvantages of both Percentage of Direct Material Cost and Percentage of Direct Labour Cost.
- Job Rate Method is very simple and acceptable if all the jobs are of the same type. If they are different, this method is not appropriate for changing overheads.

(c) Recommendation to the Company

It will be appropriate to have separate overhead rates based on labour hours and machine hours for absorption of labour related overhead and machine related overhead respectively. However, if the degree of mechanisation is very high in the factory and a single rate is desired for simplicity, the machine hour rate may be used for absorption of production overheads.

Example 6.9

The machine shop of a manufacturing concern has 6 identical machines manned by 6 operators. The total cost of the machines is Rs 8,00,000. The following information relates to six monthly period ended 30 September 2000:

Normal available hours per month	208
Absenteeism (without pay) hrs per month	18
Leave (with pay) hours per month	20
Normal ideal time hours per month	10
Average rate of wages per hour per operator	Rs 2.50
Production bonus	15% on wages
Power and fuel consumption	Rs 9,000
Supervision and indirect labour	Rs 3,300
Electricity, lighting	Rs 1,200
Repairs and maintenance (per annum)	3% of value of machine
Insurance (per annum)	Rs 42,000
Depreciation (per annum)	10% of original cost
Allocated factory overheads (per annum)	Rs 75,670
Calculate machine hour rate.	

(B. Com. (Hons), Delhi 2001)

Solution

Before computing the comprehensive machine hour rate, it is necessary to find out the total machine hours utilized and total wages paid to the operators.

Computation of total machine hours utilised

Normal available hours p.m. per operator =	208 Hours.
Less: Unutilised hours due to:	
Absenteeism	18 Hours
Leave	20 Hours
Idle time	10 Hours
	48 Hours
Total hours utilized p.m. per operator	160 Hours
Total hours utilised for six months for 6 operators	

$$= 160 \times 6 \times 6 = 5760$$

It is given in the question that these 6 machines were manned by 6 operators. Therefore, hours utilised for 6 operators i.e. 5760 hours represent the total machine hours.

Total wages to 6 operators for 6 months

Average rate of wages per hour is given = Rs 2.50

Normal hours for which wages are to be paid

$$= 208 - 18 = 190 \text{ hrs.}$$

Wages for 6 months for 6 operators @ Rs 2.50 per hr.
 $= 190 \times 6 \times 6 \times 2.50 = 17,100$

	Rs
Operator wages (as calculated above)	17,100
Production Bonus (15% of wages) $\frac{17100 \times 15}{100} =$	2,565
Power Consumed	9,000
Supervision and Indirect labour	3,300
Electricity and Lighting	1,200
Repair and Maintenance (3% of value of machine p.a.) $\frac{8,00,000 \times 3 \times 6}{100 \times 12}$	12,000
Insurance (per annum given) $\frac{42,000 \times 50}{100}$	21,000
Depreciation for six months $\frac{8,00,000 \times 10 \times 6}{100 \times 12}$	40,000
Allocated factory overheads given per annum $\frac{75,670 \times 6}{12} =$	37,835
Total overhead for 6 months	1,44,000
Machine hour rate = $\frac{1,44,000}{5,760 \text{ Hrs}} =$ Rs 25 per hour	

Example 6.10

The following information is made available from the costing records of a factory:

(i) The original cost of the machine	Rs 1,00,000
Estimated life	10 years
Residual value	Rs 5,000

Factory operates for 48 hours per week—52 weeks in a year. Allow 15% towards machine maintenance downtime. 5% may be allowed as setting up time.

(ii) Electricity used by the machine is 10 units per hour at a cost of 50 paise per unit.

(iii) Repairs and maintenance cost is Rs 500 per month.

(iv) Two operators attend the machine during operation along with two other machines. Their total wages, including fringe benefits, amount to Rs 5,000 per month.

(v) Other overheads attributable to the machine are Rs 10,431 per year.

Using the above data, calculate machine hour rate.

(B. Com. (Hons), Delhi 2000)

Solution

Calculation of Machine Hour rate.		Rs
Annual Working Hours 48×52	=	2,496
Less: Machine maintenance and setting up time. (15% + 5%) = 20%	=	499
Normal Working Hours per annum	=	1,997

	Rs	Rs
Standing Charges per annum:		
Two operators wages along with two other machine = $\frac{5000 \times 12 \times 1}{3}$	20,000	
Other overheads	<u>10,431</u>	
Total Standing Charges	<u>30,431</u>	
Hourly Rate of Standing Charges Rs 30431/1997		15.238
Variable expenses per hour:		
Depreciation: $\frac{1,00,000 - 5,000}{10 \times 1997}$		4.757
Repairs and Maintenance = $\frac{500 \times 12}{1997}$		3.004
Power 10 unit \times .50		<u>5.000</u>
Machine hour rate		<u>27.999</u>

Example 6.11

X Ltd. having fifteen different types of automatic machines furnishes information as under for 1996-97:

- (i) Overhead expenses: Factory rent Rs 96,000 (Floor area 80,000 sq. ft.). Heat and gas Rs 45,000 and supervision Rs 1,20,000.
- (ii) Wages of the operator are Rs 48 per day of 8 hours. He attends to one machine when it is under set up and two machines while they are under operation.

In respect of machine B (one of the above machines) the following particulars are furnished:

- (i) Cost of machine Rs 45,000, life of machine-10 years and scrap value at the end of its life Rs 5,000.
- (ii) Annual expenses on special equipment attached to the machine are estimated at Rs 3,000.
- (iii) Estimated operation time of the machine is 3,600 hours while set up time is 400 hours per annum.
- (iv) The machine occupies 5,000 sq. ft. of floor area.
- (v) Power costs Rs 2 per hour while machine is in operation.

Find out the comprehensive machine hour rate of machine B. Also find out machine costs to be absorbed in respect of use of machine B on the following two work-orders:

	Work-order 31	Work-order 32
Machine set up time (Hours)	10	20
Machine operation time (Hours)	90	180

(CA Inter, May 1997)

Solution

X Ltd.

Computation of Comprehensive Machine Hour Rate of Machine B

	Amount Rs
Standing Charges:	
Factory Rent (Rs 96,000/80,000 sq. ft.) × 5,000 sq. ft.)	6,000
Heat and Gas (Rs 45,000/15 machines)	3,000
Supervision (Rs 1,20,000/15 machines)	8,000
Depreciation on $\left(\frac{\text{Rs } 45,000 - \text{Rs } 5,000}{10 \text{ Years}}\right)$	4,000
Annual Expenses on special equipment	3,000
	24,000
Fixed Cost per hour (Rs 24,000/4,000 hrs.)	Rs 6

Particulars	Set up rate per hour Rs	Operation rate per hour Rs
Fixed Cost	6	6
Power	—	2
Wages	6	3
Total	12	11
Comprehensive Machine Hour Rate Rs 12 + Rs 11 = Rs 23		

Note: Depreciation has been taken as a fixed cost.

Statement of 'B' Machine Costs
(to be absorbed on the two work orders)

Particulars	Work order 31			Work order 32		
	Hours	Rate Rs	Amount Rs	Hours	Rate Rs	Amount Rs
Set up time cost	10	12	120	20	12	240
Operation time cost	90	11	990	180	11	1,980
Total Cost:			1,110			2,220

Example 6.12

(a) Calculate the machine hour rate of a machine with information given below:

Operating date:

Total number of weeks per quarter	=	13
Total number of hours per week	=	48
Stoppage due to maintenance	=	8 hrs. p.m.
Time taken for set-up	=	2 hrs./week

Cost details:

Cost of machine	=	Rs 2,00,000
Repair and maintenance	=	Rs 24,000 p.a.
Consumable stores	=	Rs 30,000 p.a.
Rent, rates and taxes	=	Rs 8,000 per quarter
Operator's wages	=	Rs 3,000 p.m.
Supervisor's salary	=	Rs 5,000 p.m.
Cost of power	=	15 units per hour at Rs 3 per unit

Notes:

- (i) Life of the machine is 10 years. Depreciation is provided on straight line basis and is treated as variable cost.
- (ii) Repairs and maintenance and consumable stores are variable costs.
- (iii) Power is consumed for production runs only and for set-up maintenance. But cost of power is to be borne by the total time excluding maintenance stoppages.
- (iv) The supervisor is supervising work on five identical machines including the one now considered.
- (b) The company hires out excess capacity in the machine shop for outside jobs. Assuming that hire charges are fixed at variable cost plus 20% what rate should be quoted by the company?

*(ICWA Inter, June 1999)**Solution***(a) Computation of Machine Hour Rate**

<i>Particulars</i>	<i>Amount p.a. Rs</i>	<i>Amount per quarter Rs</i>	<i>Total per quarter Rs</i>
<i>Machine Expenses</i>			
Repairs and Maintenance	24,000	6,000	
Consumable Stores	30,000	7,500	
Depreciation (Rs 2,00,000 × 1/10)	20,000	5,000	
Power		27,000	45,500
15 Units @ Rs 3 for 600 hours (for a quarter)			
<i>Standing Charges:</i>		8,000	
Rent, Rates and Taxes (@ Rs 8,000 per quarter)			
Operator's Wages (@ Rs 3,000 p.m.)		9,000	
Supervisor's Salary (1/5 of Rs 5,000 p.m. or Rs 1,000 p.m.)		3,000	20,000
Total Cost			<u>65,500</u>
Total Machine Hours for a quarter			600
Machine Hour Rate			<u>Rs 65,500</u> 600 <u>= 109.16</u>

Working Notes:

1. Total Effective Machine Hrs. in a quarter	=	13 × 48	=	624
Less: Maintenance Stoppage	=	8 × 3	=	24
				<u>600</u>

2. Power is being consumed during set-up also. Hence, power has been assumed for 600 hours.
3. Set up time has been taken as productive time.

(b) Computation of Rate to be quoted

Variable Cost per hour	=	Rs 45,500/600 hrs	=	Rs 75.83
Add: 20% Margin			=	Rs 15.17
				<u>Rs 91.00</u>

Example 6.13

A machine was purchased on 1st January 1998 for Rs 5 lakhs. The total cost of all machinery inclusive of the new machine was Rs 75 lakhs. The following further particulars are available:

Expected life of the machine 10 years.

Scrap value at the end of 10 years Rs 5,000.

Repairs and Maintenance for the machine during the year Rs 2,000.

Expected number of working hours of the machine per year 4,000 hours.

Insurance premium annually for all machines Rs 4,500.

Power consumption for the machine per hour @ 75 paise per unit – 25 units.

Area occupied by the machine 100 sq. ft.

Area occupied by other machines 1,500 sq. ft.

Rent per month of the department Rs 800.

Lighting charges for 20 points for the whole department out of which three points are for the new machine—Rs. 120 per month.

Compute the machine hour rate for the new machine.

(B. Com. (Hons), Delhi 1999)

Solution

Computation of Machine Hour Rate

<i>Standing Charges</i>	<i>Rs per annum</i>	<i>Re per hour</i>
Insurance (WN 2)	300	
Repairs & Maintenance	2,000	
Rent (WN 3)	600	
Light Charges	216	
	<u>3,116</u>	
Hrly. Rate of Standing Charges	3,116/4,000 hrs	0.779
<i>Machine Expenses</i>		
Depreciation (WN 1)*		12.375
Electricity Consumption: 25 units per hour @ Re 0.75 per unit		18.750
Machine Hour Rate		<u>31.904</u>

* Depreciation may also be taken as a standing charge.

Working Notes:

- | | |
|---|---------------|
| 1. <i>Depreciation of machine</i> | Rs |
| Cost of New Machine | 5,00,000 |
| Less: Scrap Value | 5,000 |
| Net Cost of the Machine | 4,95,000 |
| Life of the Machine | 10 years |
| Depreciation per hour : $\frac{4,95,000}{10 \text{ years} \times 4,000} = \text{Rs } 12.375$ | |
| 2. <i>Insurance for the Machine</i> | |
| Total cost of all Machines | Rs 75,00,000 |
| Total insurance premium paid for all machines | Rs 4,500 |
| Total annual insurance premium of the new machine: $\frac{4,500 \times 5,00,000}{75,00,000} = \text{Rs } 300$ | |
| 3. <i>Rent for the Machine</i> | |
| Rent paid per annum | Rs 9,600 |
| Total area occupied | 1,600 sq. ft. |
| Rent for the area occupied by the machine (100 sq. ft.) $\frac{9,600 \times 100}{1,600} = \text{Rs } 600$ | |
| 4. <i>Lighting Charges for the Machine</i> | |
| Total annual lighting charges of 20 points for the whole department | Rs 1,440 |
| Lighting charges of the machine p.a.: $\frac{\text{Rs } 1,440 \times 3 \text{ points}}{20 \text{ points}} = \text{Rs } 216$ | |

Example 6.14

Meerut Manufacturing Company makes several product lines which are processed through three production departments—X, Y and Z.

The information concerning the relevant data for a year is as follows:

	Factory overhead (including share of service department) Rs	Direct labour hours	Direct labour cost Rs
Department X	1,24,000	80,000	1,60,000
Department Y	2,30,000	1,15,000	2,41,500
Department Z	5,46,000	1,05,000	1,99,500

Production records at the end of the year indicated the following for the product line 'Krish':

	Deptt. X Rs	Deptt. Y Rs	Deptt. Z Rs
Unit Produced			20,000
Prime cost	45,000	10,500	59,500
Direct labour hours	10,000	5,000	30,000

You are required to—

- calculate the departmental and plant-wide, overhead rate based on direct labour hours;
- compute the cost of 'Krish' line for the year by using (i) plant-wide rate and (ii) departmental rates; and
- comment on the results.

(B. Com. (Hons), Delhi, 1994)

Solution

Departmental overhead rate

$$\text{Deptt. X} = \frac{124000}{80000} = \text{Rs } 1.55$$

$$\text{Deptt. Y} = \frac{230000}{115000} = \text{Rs } 2.00$$

$$\text{Deptt. Z} = \frac{546000}{105000} = \text{Rs } 5.20$$

Plant-wide overhead

$$\text{Direct labour hour rate} = \frac{900000}{300000} = \text{Rs } 3$$

1,24,000	80,000
2,30,000	1,15,000
5,46,000	1,05,000
<u>Rs 9,00,000</u>	<u>3,00,000 hrs</u>

Cost of 'Krish' line

	Deptt. rates			Plant-wide
	X Rs	Y Rs	Z Rs	Rs
Prime cost	45,000	10,500	59,500	1,15,000
Factory overheads				
X = 10,000 × 1.55	15,500			
Y = 5,000 × 2		10,000		
Z = 30,000 × 5.20			1,56,000	
Plant-wide 45,000 × 3				1,35,000
	<u>60,500</u>	<u>20,500</u>	<u>2,15,500</u>	<u>2,50,000</u>

Example 6.15

M/s. Sistas & Co. manufacture product A at the rate of 80 pieces per hour. The company has been producing and selling 1,60,000 units annually during the period 1991 to 1995. However, during the year 1996 the company was able to produce 1,46,000 units only. The company's annual fixed overhead for 1996 amounted to Rs 5,84,000. The company works on single shift only at 8 hours per day and 6 days a week. The company had declared 13 holidays during the year 1996. The quarterly preventive maintenance and repairs work involved 77 hours.

You are required to:

- calculate the maximum, practical, normal and actual capacities in 1996, in terms of hours;
- compute the idle capacity and hourly rate for recovery of overhead rates for each of the capacities computed at (a) above; and
- prepare a statement showing the idle capacity cost assuming that the overhead rates of recovery are based on the various capacities arrived at (a) above. (ICWA Inter, June 1997)

Solution

(a) Computation of Maximum, Practical, Normal and Actual Capacities in 1996

		Hours
(i)	<i>Maximum Capacity:</i> Total Days in 1996 × Single eight hours shift: = 366* × 8	<u>2,928</u>
(ii)	<i>Practical Capacity:</i> Maximum Capacity <i>Less:</i> Idle capacity due to various reasons: Idle capacity due to Sundays—52 × 8 = 416 hrs. Holidays—13 × 8 = 104 hrs. Quarterly preventive Maintenance & Repairs 77 × 4 = 308 hrs.	<u>2,928</u> <u>828</u> <u>2,100</u>
(iii)	<i>Normal Capacity:</i> (Normal Production and Sales expected) ÷ Rate of Production per hour = (1,60,000 ÷ 80 units)	<u>2,000</u>
(iv)	<i>Actual Capacity:</i> Actual capacity utilised: (Total Production ÷ Hourly Rate of Production) = 1,46,000 ÷ 80	<u>1,825</u>

(b) Statement Showing Idle Capacity and Hourly Rate for Recovery of Overhead Rates

Base	Base capacity (hours)	Capacity utilised (hours)	Idle capacity (hours)	Hourly Rate of recovery for Fixed Ovhd's (Rs) See Working Note
(i) Maximum Capacity	2,928	1,825	1,103	199.45
(ii) Production Capacity	2,100	1,825	275	278.10
(iii) Normal Capacity	2,000	1,825	175	292.00
(iv) Actual Capacity	1,825	1,825	—	320.00

*In 1996, February will be of 29 days. Therefore, total days will be 366 days.

Working Note:

Hourly Rate of Recovery for Fixed Overhead = Total Fixed Overheads/Base Capacity Hours.

- (i) $5,84,000/2,928 = 199.45$
 (ii) $5,84,000/2,100 = 278.10$
 (iii) $5,84,000/2,000 = 292.00$
 (iv) $5,84,000/1,825 = 320.00$

(c) Statement of Idle Capacity

Base Capacity	Overhead Absorption	Applied Fixed Overhead		Idle Capacity Cost	
		Rate per hour Rs	Hours	Amount Rs	Hours
(i) Maximum	199.45	1,825	3,64,003	1,103	2,19,993
(ii) Practical	278.10	1,825	5,07,532	275	76,476
(iii) Normal	292.00	1,825	5,32,900	175	51,100
(iv) Actual	320.00	1,825	5,84,000	—	—

Example 6.16

In an engineering company, the factory overheads are recovered a fixed percentage basis on direct wages and the administrative overheads are absorbed on a fixed percentage basis on factory cost.

The company has furnished the following data relating to the two jobs undertaken by it in a month.

Particulars	Job 101	Job 102
	Rs	Rs
Direct Materials	54,000	37,500
Direct Wages	42,000	30,000
Selling Price	1,66,650	1,28,250
Profit Percentage on Total Cost	10%	20%

Required:

- (i) Computation of percentage recovery rates of factory overheads and administrative overheads:
 (ii) Calculation of the amount of factory overheads, administrative overheads and profit for each of the two jobs.
 (iii) Using the above recovery rates fix the selling price of Job 103. The additional data being:
- | | |
|------------------------------------|-----------|
| Direct Materials | Rs 24,000 |
| Direct Wages | Rs 20,000 |
| Profit Percentage on Selling Price | 12-1/2% |

(CA Inter, May 1995)

Solution**(i) Computation of Overhead Recovery Rate**

Let the Factory Overhead Rate be x and Office Overhead Rate be y .

Total Cost of Job 101 = $1,66,650 \times 100/110 = \text{Rs } 1,51,500$

Total Cost of Job 102 = $1,28,250 \times 100/120 = \text{Rs } 1,06,875$

Factory Cost of Job 101

$$96,000 + 42,000 \times x/100 = \text{Rs } 96,000 + 420x$$

Factory Cost of Job 102

$$67,500 + 30,000 \times x/100 = 67,500 + 300x$$

Total Cost of Production of Job 101

$$\begin{aligned} &96,000 + 420x + y/100 (96,000 + 420x) \\ &= 96,000 + 420x + 960y + 4.20xy \end{aligned}$$

Total Cost of Production of Job 102

$$\begin{aligned} &67,500 + 300x + y/100 (67,500 + 300x) \\ &= 67,500 + 300x + 675y + 3xy \end{aligned}$$

Thus,

$$96,000 + 420x + 960y + 4.20xy = \text{Rs } 1,51,500$$

$$\text{or } 420x + 960y + 4.20xy = \text{Rs } 55,500 \quad (1)$$

$$67,500 + 300x + 675y + 3xy = 106875$$

$$\text{or } 300x + 675y + 3xy = \text{Rs } 39,375 \quad (2)$$

On multiplying equation (2) by 1.4 and subtracting it from equation (1)

$$420x + 960y + 4.20xy = 55,500$$

$$420x + 945y + 4.20xy = 55,125$$

$$\hline 15y = 375$$

or

$$y = 25$$

That is, Administrative overheads is 25% of factory cost.

On substituting the value of y in equation (1)

$$420x + 960 \times 25 + 4.20x \times 25 = \text{Rs } 55,500$$

$$\text{or } 420x + 24,000 + 105x = 55,500$$

$$\text{or } 525x = 31,500$$

$$\text{or } x = 60$$

That is, factory overheads is 60% of direct wages.

(ii) Computation of Cost and Profit on Jobs

<i>Particulars</i>	<i>Job 101</i> <i>Rs</i>	<i>Job 102</i> <i>Rs</i>
Direct Materials	54,000	37,500
Direct Wages	42,000	30,000
Prime Cost	96,000	67,500
<i>Factory Overheads</i>		
60% of Direct Wages	25,200	18,000
Factory Cost	1,21,200	85,500
<i>Administrative Overheads</i>		
25% of Factory Cost	30,300	21,375
Total Cost	1,51,500	1,06,875
Profit (Balancing figure)	15,150	21,375
Selling Price	1,66,650	1,28,250

(iii) Statement of Selling Price of Job 103

<i>Particulars</i>	<i>Rs</i>
Direct Materials	24,000
Direct Wages	20,000
Prime Cost	44,000
Factory Overheads (60% of Direct Wages)	12,000
Factory Cost	56,000
Administrative Overheads (25% of Factory Cost)	14,000
Total Cost	70,000
Profit (Balancing figure)	10,000
Selling Price [Total Cost/87.5%]	80,000

OVERHEAD RATES: ACTUAL VS PREDETERMINED (STANDARD)

The basic purpose of overhead absorption rates is to absorb total factory overhead in products or jobs manufactured. This objective can be achieved through actual overhead rate or predetermined overhead rate.

Actual Overhead Rate

When the absorption is based on actual overhead, it is known as actual absorption rate. This can be calculated only after the end of the accounting period when all cost and production figures have been collected. This method has the following disadvantages:

1. Product cost cannot be determined until some considerable time after the end of the accounting period. This may not help in controlling cost and in fixing selling prices.
2. There are likely to be variations in the overhead incurred because of the seasonal nature of some overhead costs, change in the volume of production and efficiency of the factory for different periods.
3. Some overhead costs are of fixed nature, such as depreciation, supervision, property taxes, etc. These overhead costs being constant give a different per unit cost when divided by differing production volumes. Also, some overheads like fire insurance premium are paid in advance but this should be charged to all work done/products manufactured during the year. How should the absorption be done? It creates an inequitable situation.

Predetermined Overhead Rate or Standard Rate

Because of the limitations of the actual overhead rate stated above, a predetermined or standard overhead rate is generally used by companies. This is a rate calculated in advance of the period in which it is to be used, by dividing the estimated period overhead to be absorbed by the estimated period production. Production may be measured on any of the absorption bases, such as prime cost, labour hours, etc.

The primary objective of predetermined overhead rate is to provide a reasonably constant unit cost and to avoid unit cost fluctuations caused by seasonal overhead cost fluctuations, changes in volume, or accounting methods.

Secondly, predetermined overhead rates also make possible the immediate costing of job or products completed during the month. When a job is finished, the absorption rate is multiplied by the absorption base to find out the total amount to be charged to the product or job. Under a process costing system, predetermined overhead rate is used to charge overhead to the output of the process in question.

Thirdly, predetermined rates contribute effectively to standard costing and budgetary control programmes as these programmes use estimated costs and standard cost to measure production activities.

Under-or Over-absorption of Overhead

The use of a predetermined or standard rate may, therefore, result in under-absorption or over-absorption. When the amount absorbed is less than the actual overhead, there is under-absorption. Over-absorption arises when the amount absorbed is more than the actual overhead. Since actual overheads are not recorded in cost accounts, under-absorption and over-absorption can be treated in any one of the following ways:

1. In a seasonal business firm, the balance (due to under or over-absorption) may be carried forward to the subsequent period with the expectation that it will be counterbalanced at the end of accounting period. This is clear from the following example.

Months	Production units	Overhead absorbed Rs 2 per unit	Actual overhead	Under or over-absorption
July	1000	2000	3,000	- 1,000
August	1500	3000	4,200	- 1,200
September	3000	6000	3,800	+ 2,200

2. A supplementary rate can be used to adjust the amount of under or over-absorption. The supplementary rate is determined by dividing the amount of under or over-absorption by the actual absorption base. Under-absorption is adjusted by using a plus supplementary rate while a minus supplementary rate is used to correct over-absorption. For instance, in the above example, a plus supplementary rate of Rs 1 per unit (Rs 1000/1000 units) can be used to increase the recorded overhead by Rs 1,000 for the month of July. Similarly, a minus supplementary rate of Rs 0.733 $\left(\frac{2200}{3000}\right)$ can be used to decrease the recorded overhead by Rs 2,200.

Example 6.17

The Cost Account of Novo Chemicals Ltd. determined the overhead recovery rate for the year 2000, (based on direct labour hours) with the following estimates:

Indirect labour	Rs 1,15,000
Inspection	70,000
Factory supervision	50,000
Depreciation and maintenance	1,25,000
Total factory overhead	3,60,000
Direct labour hours	75,000
Hourly wage rate	Rs 15

The actual results for the year are as follows:

	Rs
Indirect labour	99,000
Inspection	73,000
Factory supervision	51,000
Depreciation and maintenance	1,15,000
Total actual factory overhead	3,38,000
Direct labour hours	67,600
Hourly wage rate	Rs 16

Calculate the pre-determined overhead recovery rate and find out the amount of over/under-absorption if any.

How will you treat the over/under-absorption amount in Cost Accounts?

(B. Com. (Hons), Delhi)

Solution

Pre-determined overhead recovery rate	= Estimated overheads/Estimated direct labour hours
	= 3,60,000/75,000
	= Rs 4.80 per hour
Overheads recovered	= 67,600 × 4.8
	= Rs 3,24,480
Under-recovery of overheads	= Rs 3,38,000 – Rs 3,24,480
	= Rs 13,520
Supplementary rate (Positive)	= 13,520/67,600
	= Rs 0.20 per hour

The under-recovery of Rs 13,520 may be charged from production on the basis of supplementary overhead rate amounting to Re 0.20 per direct labour hour.

Example 6.18

The actual total expenditure of a light engineering factory was Rs 6,75,912. Overheads were recorded at the rate of Rs 2 per hour at normal capacity of the factory. Out of 10,000 units produced, only 8,000 units were sold. 500 units were in work in progress. Actual hours worked were 2,84,756. Sixty per cent of the difference between the actual and applied overheads was due to fluctuations in material prices and labour rates. There was a fire in the factory during this accounting period and the company lost Rs 50,000 of which the buildings accounted for Rs 30,000 and the balance represented loss of materials stored in the godown. A sum of Rs 10,000 was paid as wages to workmen during the strike period. The balance amount represented the difference between the actual and applied overheads due to operational efficiency or inefficiency.

Calculate the under/over absorption of production overheads for the period and state the appropriate treatment in cost accounts.

(B. Com. (Hons), Delhi 1999)

*Solution**Unabsorbed Overheads*

Overheads recovered from production $2,84,756 \times 2 =$	5,69,512
Actual Overheads	6,75,912
Under Recovery	<u>1,06,400</u>

Out of the total amount of unabsorbed overheads Rs 1,06,400, 60% was due to fluctuations in the prices of material and labour rates. The amount of Rs 63,840 (i.e., 60% of Rs 1,06,400) should therefore be charged to units produced by means of supplementary rate.

$$\text{Supplementary Rate} = \frac{63,840}{10,500} = \text{Rs } 6.08$$

Apportionment of Overheads

The amount of Rs 63,840 will be apportioned between Cost of Sales, Finished Goods and Work-in-progress as follows:

		Rs
Cost of Sales A/c	$(8,000 \times 6.08)$	= 48,640
Finished Goods A/c	$(2,000 \times 6.08)$	= 12,160
Work-in-progress A/c	(500×6.08)	= 3,040
		<u>63,840</u>

The balance of Rs 42,560 (40% of Rs 1,06,400) which represents unabsorbed overheads on account of abnormal factors such as strike, operational inefficiency etc. should be charged to Costing Profit & Loss Account.

Example 6.19

Sweet Dreams Ltd. uses a historical cost system and absorbs overhead on the basis of predetermined rate. The following data are available for the year ended 31st March, 1997:

	Rs
Manufacturing overheads—	
Amount actually spent	1,70,000
Amount absorbed	1,50,000
Cost of goods sold	3,36,000
Stock of finished goods	96,000
Works-in-progress	48,000

Using two methods of disposal of under-absorbed overheads show the implication on the profits of the company under each method.

(CA Inter, Nov. 1997)

Solution

The following are the two methods for disposal of under-absorbed overheads:

The total unabsorbed overhead of Rs 20,000 can be written off in Costing Profit and Loss Account. In case of this method, the profits of the concern will get reduced by Rs 20,000 for the period.

Supplementary: A supplementary rate may be used to adjust the overhead cost of each cost unit. The total under-absorbed amount may, at the end of accounting period, be apportioned on proportionate basis over cost of goods sold; stock of finished goods and work-in-progress. This can be done as shown below:

Apportionment of Under-Absorbed Overhead

	Rs	Rs	Rs
Cost of goods sold (WN 1)	3,36,000	14,000	3,50,000
Stock of finished goods (WN 2)	96,000	4,000	1,00,000
Work-in-progress (WN 3)	48,000	2,000	50,000
	4,80,000	20,000	5,00,000

Working Notes:

- (1) Under-absorbed overheads absorbed by cost of goods sold = $\frac{\text{Rs } 3,36,000}{\text{Rs } 4,80,000} \times \text{Rs } 20,000 = \text{Rs } 14,000$
- (2) Under-absorbed overheads absorbed by stock of finished goods = $\frac{\text{Rs } 96,000}{\text{Rs } 4,80,000} \times \text{Rs } 20,000 = \text{Rs } 4,000$
- (3) Under-absorbed overhead absorbed by WIP = $\frac{\text{Rs } 48,000}{\text{Rs } 4,80,000} \times \text{Rs } 20,000 = \text{Rs } 2,000$

Example 6.20

In a manufacturing unit overhead was recovered at a predetermined rate of Rs 20 per labour-hour. The total factory overhead incurred and the labour-hours actually worked were Rs 45,00,000 and 2,00,000 labour-hours respectively. During this period 30,000 units were sold. At the end of the period 5,000 units were held in stock while there was no opening stock of finished goods. Similarly, though there was no stock of uncompleted units at the beginning of the period, at the end of the period there were 10,000 uncompleted units which may be reckoned at 50% complete.

On analysing the reasons, it was found that 60% of the unabsorbed overheads were due to defective planning and rest were attributable to increase in overhead costs.

How would unabsorbed overheads be treated in cost accounts?

(CA Inter, Nov. 1995)

Solution

Computation of Unabsorbed Overheads

Labour Hours actually worked	2,00,000
Overhead Rate per Hour	Rs 20
Overheads absorbed at Rs 20 per labour hour (A) (20,00,000 hours × Rs 20)	40,00,000
Overheads actually incurred (B)	45,00,000
Unabsorbed Overheads (B) – (A)	5,00,000
Unabsorbed Overheads	
(a) due to defective planning (i.e., 60% of Rs 5,00,000)	3,00,000
(b) Balance of unabsorbed overheads due to increase in overhead costs	2,00,000
	5,00,000

Disposition of unabsorbed overhead

- (i) The unabsorbed overheads of Rs 3,00,000 due to defective planning may be treated as abnormal and should therefore be charged to Costing Profit and Loss Account.

- (ii) Balance of unabsorbed overheads of Rs 2,00,000 may be treated as normal and, therefore should be charged by a supplementary overhead absorption rate computed as under:

Total Production during the year:	
Units produced	35,000
Add: Equivalent units of work-in-progress 10,000 units, 50% complete	5,000
Total Units	<u>40,000</u>

Supplementary Overhead Absorption Rate comes to:

$$= \frac{\text{Rs } 2,00,000}{40,000} = \text{Rs } 5 \text{ per unit}$$

Disposition of Normal Unabsorbed Overheads of Rs 2,00,000

	<i>Rs</i>
(i) Charged to Costing Profit & Loss A/c (as part of cost of units sold 30,000 units × Rs 5)	1,50,000
(ii) Charged to Closing Stock of Finished Goods: 5,000 finished goods in stock @ Rs 5 per unit	25,000
(iii) Charged to work-in-progress: 10,000 units, 50% complete, i.e., 5,000 equivalent units @ Rs 5 per unit	<u>25,000</u>
Total	<u>2,00,000</u>

Example 6.21

XYZ Company uses a historical cost system and applies overheads on the basis of 'predetermined rates'. The following data are available from the records of the company for the year ended March 31, 1990:

Manufacturing overheads	Rs 8,50,000
Manufacturing overheads applied	Rs 7,50,000
Work-in-progress	Rs 2,40,000
Finished goods sold	Rs 4,80,000
Cost of goods sold	Rs 16,80,000

Apply two methods for disposal of underabsorbed overheads showing the implications of each method on the profits of the Company.

(B. Com. (Hons), Delhi 1996)

Solution:

XYZ Limited

Actual manufacturing overheads	Rs 8,50,000
Overheads recovered	<u>Rs 7,50,000</u>
	<u>Rs 1,00,000</u>

The following are the alternative methods for treatment of unabsorbed overheads:

Alternative I

The entire amount of under-absorption may be carried forward to the next year, if it is presumed that such under-absorption is due to seasonal or cyclical fluctuations.

Alternative II

The under-absorbed amount of Rs 1,00,000 may be apportioned among Cost of Sales, Work-in-Progress and Finished Goods as Under:

	Amount Rs	Under-absorbed overheads applied Rs	Total Rs
Cost of sales	16,80,000	70,000	17,50,000
Work-in-progress	2,40,000	10,000	2,50,000
Finished goods stock	4,80,000	20,000	5,00,000
	24,00,000	1,00,000	25,00,000

Under alternative I there will be no impact on profits of the current year due to under-absorption. However, under alternative II, the profit will get reduced by Rs 70,000, the amount charged to cost of sales account.

Example 6.22

The factory overhead costs of four production departments of a company engaged in executing job orders, for an accounting year, are as follows:

	Rs
A	19,300
B	4,200
C	4,000
D	2,000

Overhead has been applied as under:

Deptt.	A	Rs 1.50 per Machine Hour for 14,000 hours
Deptt.	B	Rs 1.30 per Direct Labour Hour for 3,000 hours
Deptt.	C	80% of Direct Labour Cost of Rs 6,000/-
Deptt.	D	Rs 2/- per piece, for 950 pieces.

Find out the amount of department-wise under or over-absorbed factory overheads. (ICWA Inter)

Solution

(i) Total Amount of Factory Overheads Absorbed

Department	Total amount absorbed (Rs)	Basis
A	21,000	Rs 1.50 per machine hour for 14,000 machine hours
B	3,900	Rs 1.30 per direct labour hour for 3,000 hours
C	4,800	Rs 80% of direct labour cost of (Rs 6,000 × 80%)
D	1,900	Rs 2/- per piece for 950 pieces.
Total	31,600	

(ii) Amount of Under or Over Absorbed Factory Overheads

Department	Factory overheads incurred	Factory overheads absorbed	Under absorbed (-) Over absorbed (+)
(1)	Rs (2)	Rs (3)	(3) - (2) Rs (4)
A	19,300	21,000	(+) 1,700
B	4,200	3,900	(-) 300
C	4,000	4,800	(+) 800
D	2,000	1,900	(-) 100
	<u>29,500</u>	<u>31,600</u>	<u>(+) 2,100</u>

Example 6.23

Jones Ltd. has a budgeted activity level of 50,000 direct labour hours and budgeted production overheads of Rs 100,000. You are required to calculate the underabsorbed and overabsorbed overheads, giving reasons, if,

- 50,000 direct labour hours are worked and the actual overheads were Rs 94,000.
- 43,000 direct labour hours are worked and the actual overheads were Rs 100,000.
- 43,000 direct labour hours are worked and the actual overheads were Rs 94,000.

Solution

$$\text{Recovery rate} = \frac{\text{Rs } 100,000}{50,000 \text{ hours}} = \text{Rs } 2/\text{hour}$$

(a) Recovered overheads (50,000 hours × Rs 2)	Rs 100,000
Actual overheads incurred;	<u>Rs 94,000</u>
Overabsorbed	<u>Rs 6,000</u>

The reason for this overabsorption is expenditure, that is, actual cost are less than anticipated.

(b) Recovered overheads (43,000 hours × Rs 2)	Rs 86,000
Actual overheads incurred:	<u>Rs 100,000</u>
Underabsorbed	<u>Rs 14,000</u>

The reason for this underabsorption is a production volume variance, that is, 7,000 less hours were worked than expected at Rs 2/hour = Rs 14,000.

(c) Recovery overheads (43,000 hours × Rs 2)	Rs 86,000
Actual overheads incurred:	<u>Rs 94,000</u>
Underabsorbed	<u>Rs 8,000</u>

The reason for this underabsorption is two fold:

- production volume variance of (50,000 hours - 43,000 hours) × Rs 2/hour = Rs 14,000 adverse
- expenditure variance of (Rs 100,000 - Rs 94,000) = Rs 6,000 favourable. In total Rs 8000 is adverse (under-absorbed)

Overabsorbed and underabsorbed overheads are charged to the profit and loss account via an underabsorbed/overabsorbed overhead account. Overabsorbed overheads will be credited to the profit and loss account, and underabsorbed overheads will be debited to it.

Example 6.24

The total overhead expenses of a factory are Rs 4,46,380. Taking into account the normal working of the factory, overhead was recovered in production at Rs 1.25 per hour. The actual hours worked were 2,93,104. How would you proceed to close the books of accounts, assuming that besides 7,800 units produced of which 7,000 were sold, there were 200 equivalent units in work-in-progress?

On investigation, it was found that 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour and the remaining 50% was due to factory inefficiency. Also give the profit implication of the method suggested. (CA Inter, Nov. 2000)

Solution

	Rs
Actual factory overhead expenses incurred	4,46,380
Less: Overheads recovered from production (2,93,104 hours × Rs 1.25)	3,66,380
Unabsorbed overheads	80,000

Reasons for unabsorbed overheads

- | | |
|--|--------|
| (i) 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour. | 40,000 |
| (ii) 50% of the unabsorbed overhead was due to factory inefficiency. | 40,000 |

Treatment of unabsorbed overheads in Cost Accounting

- Unabsorbed overhead amount of Rs 40,000, which was due to increase in the cost of indirect material and labour should be charged to units produced by using a supplementary rate.

$$\text{Supplementary rate} = \frac{\text{Rs } 40,000}{(7,800 + 200) \text{ units}} = \text{Rs } 5 \text{ per unit}$$

The sum of Rs 40,000 (unabsorbed overhead) should be distributed by using a supplementary rate among cost of sales, finished goods and work-in-progress as below:

Cost of sales	Rs.
(7,000 units × Rs 5)	35,000
Finished goods	4,000
(800 units × Rs 5)	
Work-in-progress	1,000
(200 units × Rs 5)	
	40,000

The use of cost of sales figure, would reduce the profit for the period by Rs 35,000 and will increase the value of stock of finished goods and work-in-progress by Rs 4,000 and Rs 1,000 respectively.

2. The balance amount of unabsorbed overheads viz. of Rs 40,000 due to factory inefficiency should be charged to Costing Profit & Loss Account, as this is an abnormal loss.

THEORY QUESTIONS

1. What are the requisites of a good method of absorption of factory overhead?
2. Explain how would you treat under/overabsorption of overheads in cost accounts.
(B. Com. (Hons), Delhi 1997)
3. Discuss the secondary distribution of overheads.
(B. Com. (Hons), Delhi 1997)
4. Describe the different bases on which factory expenses can be apportioned. Describe the merits and suitability of each of them.
5. Write a detailed critical note on the direct labour cost method of absorption of factory overheads.
(B. Com. (Hons), Delhi)
6. What information is necessary to calculate a machine hour rate for overhead absorption? State the conditions in which the method is most effective.
(B. Com. (Hons), Delhi)
7. Discuss the importance of machine hours as a basis for the absorption of factory overheads.
(B. Com. (Hons), Delhi)
8. Explain the concept of absorption of factory overheads.
(B. Com. (Hons), Delhi)
9. What do you understand by classification, allocation and apportionment in relation to overhead expenses? Explain fully.
(ICWA Inter)
10. Briefly describe two ways of dealing with apportioning service department costs among departments which, in addition to doing work for the main operation departments, also serve one another.
(ICWA Inter)
11. Discuss the statement that the impact of overheads under varying conditions of production and sales is of greater interest to the management than its method of apportionment and allocation.
(ICWA Inter)
12. Overhead costs are usually classified according to variability. What are the necessities for such classification and what purpose do such classifications serve.
(ICWA Inter)
13. State in short the reasons for the use of predetermined rates for factory overhead absorption.
(B. Com. (Hons), Delhi)
14. Describe the "prime cost" method of absorption of factory overheads. Explain fully and illustrate the basic conditions necessary for its application.
(B. Com. (Hons), Delhi)
15. Distinguish between cost allocation, cost apportionment and cost absorption.
(ICWA Inter)
16. Why do you consider departmentalisation of overheads necessary?
(B. Com. (Hons), Delhi)
17. Factory A has a lower rate of overhead absorption than Factory B. Both factories produce the same type of goods. Discuss whether this can be taken as a sign that Factory A is more efficient than Factory B.
18. Explain the different methods for apportionment of Service Department's cost over Production Departments.
(B. Com. (Hons), Delhi)
19. Explain why predetermined overhead absorption rates are preferred to overhead absorption rates calculated from factual information after the end of a financial period.
(B. Com. (Hons), Delhi)
20. What are the causes of under/over absorption of factory overheads? How will you deal with them in cost accounts?
(B. Com. (Hons), Delhi)

MULTIPLE-CHOICE QUESTIONS

- I. Select the correct answer for the following multiple choice questions:

- (i) Factory overhead includes
- All manufacturing costs
 - All manufacturing costs except direct materials and direct labour
 - Indirect materials but not indirect labour
 - Indirect labour but not indirect materials
- (ii) In order to identify costs that relate to a specific product, an allocation base should be chosen that
- does not have a cause and effect relationship
 - has a cause and effect relationship
 - considers variable costs but not fixed costs
 - considers direct materials and direct labour but not factory overhead.
- (iii) Which method of inventory pricing best approximates specific identification of the actual flow of costs and units in most manufacturing situations
- Average cost
 - First-in, First-out
 - Last-in, First-out
 - Base stock
- (iv) Prime cost means
- Direct materials
 - Direct labour
 - Direct materials and direct labour
 - Factory overhead and direct materials
- (v) Added cost of a new product will be
- Materials and labour
 - Materials, labour and factory overhead
 - Materials, labour, factory and administrative overhead
 - Materials, labour and administrative overhead.
- (vi) The actual budgeted fixed overheads amounted to Rs 84,000. The budgeted and actual production amounted to 20,000 units and 24,000 units respectively. This means that there will be:
- an under-absorption of Rs 16,800
 - an under-absorption of Rs 14,000
 - an over-absorption of Rs 16,800
 - an over-absorption of Rs 14,000
- (vii) The rent of business premises should be shared out between cost centres according to:
- floor area or cubic capacity
 - the number of employees
 - the replacement value of machinery and equipment
 - the number of kilowatt hours
- (viii) The insurance of buildings is best apportioned to cost centres using:
- floor area or cubic capacity
 - the number of employees
 - the replacement value of machinery and equipment
 - the number of kilowatt hours
- (ix) The canteen expenses should be apportioned to cost centres by:
- floor area or cubic capacity
 - the number of employees
 - the replacement value of machinery and equipment
 - the number of kilowatt hours

- (x) In the absence of more realistic information, supervision should be split up according to:
- floor area or cubic capacity
 - the number of employees
 - the replacement value of machinery and equipment
 - the number of kilowatt hours
- (xi) Which of the following bases of apportionment is most suited to sharing up the lighting costs between departments and cost centres?
- floor area or cubic capacity
 - the number of employees
 - the replacement value of machinery and equipment
 - the number of kilowatt hours
- (xii) Indirect costs can also be described as:
- overhead costs
 - prime costs
 - variable costs
 - total costs
- (xiii) Indirect costs which cannot be identified with a particular cost centre are shared out between cost centres using:
- a recovery rate
 - an absorption rate
 - a method of apportionment
 - a method of allocation
- (xiv) Which of the following is not an indirect cost?
- wages of production department machine operator
 - wages of a production department cleaner
 - materials used for machine maintenance in the production department
 - materials used to clean the production department floor
- (xv) Which of the following methods of apportionment is most suitable for allocating the rent of building between cost centres?
- number of employees
 - machine hours
 - kilowatt hours
 - floor area

PROBLEMS

1. A manufacturing company has 2 Production Departments—X and Y and 3 Service Departments—Time keeping, Stores and Maintenance. The departmental summary showed the following expenses for October 2001.

Production Departments:	Rs	Rs
X	16,000	
Y	10,000	26,000
Service Departments:		
Time-keeping	4,000	
Stores	5,000	
Maintenance	3,000	12,000
		<u>38,000</u>

The other information are:

Particulars	Production departments		Service departments		
	X	Y	Time-keeping	Stores	Maintenance
No. of employees	40	30	20	16	10
No. of stores requisitions	24	20	—	—	6
Machine-hours	2,400	16,00	—	—	—

You are required to make departmental allocation of expenses.

Ans: Total overhead costs

Deptt. X Rs 22845

Deptt. y Rs 15155

2. Deccan Manufacturing Ltd. have three departments which are regarded as production departments. Service department's costs are distributed to these production departments using the "Step Ladder Method" of distribution. Estimates of factory overhead costs to be incurred by each department in the forthcoming year are as follows. Data required for distribution is also shown against each department:

Department	Factory overhead Rs	Direct labour hours	No. of employees	Area in sq. m.
Production:				
X	1,93,000	4,000	100	3,000
Y	64,000	3,000	125	1,500
Z	83,000	4,000	85	1,500
Service:				
P	45,000	1,000	10	500
Q	75,000	5,000	50	1,500
R	1,05,000	6,000	40	1,000
S	30,000	3,000	50	1,000

The overhead costs of the four service departments are distributed in the same order, viz., P, Q, R, and S respectively on the following basis:

Department	Basis
P	Number of Employees
Q	Direct Labour Hours
R	Area in Square Metres
S	Direct Labour Hours

You are required to:

- prepare a schedule showing the distribution of overhead costs of the four service departments to the three production departments; and
- calculate the overhead recovery rate per direct labour hour for each of the three production departments.

(CA Inter)

Ans: (a) Total overheads: Production Departments X Rs 3,00,000, Y Rs 1,35,000, Z Rs 1,60,000
(b) Recovery rate: X Rs 75, Y Rs 45, Z Rs 40.

3. Modern manufacturers Ltd. has three Production Departments P₁, P₂, P₃ and two Service Departments S₁ and S₂ the details pertaining to which are as under:

	P ₁	P ₂	P ₃	S ₁	S ₂
Direct wages (Rs)	3,000	2,000	3,000	1,500	195
Working hours	3,070	4,475	2,419	—	—

Value of machines (Rs)	60,000	80,000	1,00,000	5,000	5,000
H.P. of machines	60	30	50	10	—
Light points	10	15	20	10	5
Floor space (Sq. ft)	2,000	2,500	3,000	2,000	500

The following figures extracted from accounting records are relevant:

Rent and rates	Rs 5,000
General lighting	600
Indirect wages	1,939
Power	1,500
Depreciation on machines	10,000
Sundries	9,695

The expenses of the Services Departments are allocated as under:

	P ₁	P ₂	P ₃	S ₁	S ₂
S ₁	20%	30%	40%	—	10%
S ₂	40%	20%	30%	10%	—

Find out the total cost of Product X which is processed for manufacture in Departments P₁ P₂ and P₃ for 4, 5 and 3 hours respectively, given that its Direct Material Cost is Rs 50 and Direct Labour Cost Rs 30.

Ans: Total Cost of Product X Rs 117.25.

(CA Inter)

4. A company's production costs for the year ending March 31, 2001 are given below:

Production Departments

Item	P ₁	P ₂	P ₃	Office	Stores	Workshop	Total
Direct wages	Rs 20,000	25,000	30,000	—	—	—	75,000
Direct materials	Rs 30,000	35,000	45,000	—	—	—	1,10,000
Indirect materials	Rs 2,000	3,000	3,000	1,000	2,000	2,000	13,000
Indirect wages	Rs 3,000	3,000	4,000	10,000	10,000	5,000	35,000
Area in sq. m.	200	250	300	150	100	250	1,250
Book value of machinery	Rs 30,000	35,000	25,000	—	—	15,000	1,05,000
Total H.P. of machines	15	20	25	—	—	5	65
Machine hours worked	10,000	20,000	15,000	—	—	5,000	50,000

General Expenses

	Total
(i) Rent	Rs 12,500
(ii) Insurance	Rs 1,050
(iii) Depreciation	15% of value of machinery
(iv) Power	Rs 3,800
(v) Light	Rs 1,250

You are required to prepare an overhead analysis sheet for the departments showing clearly the basis of apportionment, where necessary.

(ICWA Inter)

Ans: Total overhead Deptt. P₁ = Rs 22,588, P₂ = Rs 29,434, P₃ = Rs 30,328.

5. You are supplied with the following information and required to work out the production hour rate of recovery of overheads in Departments A, B and C.

Particulars	Total	Production Departments			Service Deptt.	
		A	B	C	P	Q
Rent	12,000	2,400	4,800	2,000	2,000	800
Electricity	4,000	800	2,000	500	400	300

(contd.)

Indirect labour	6,000	1,200	2,000	1,000	800	1,000
Depreciation of machinery	5,000	2,500	1,600	200	500	200
Sundries	4,500	910	2,143	847	300	300
Working hour	—	1,000	2,500	1,400	—	—

Expenses of Service Department P and Q are apportioned as under:

	A	B	C	P	Q
P	30%	40%	20%	—	10%
Q	10%	20%	50%	20%	—

(CA Inter)

Ans: Deptts. A Rs 9.50; B Rs 6; C Rs 5.

6. The New Enterprises Ltd. has Production Deptts. A, B and C and two Service Deptts. D and E. The following figures are extracted from the records of the company.

	Rs
Rent and rates	5,000
General lighting	600
Indirect wages	1,500
Power	1,500
Depreciation of machinery	10,000
Sundries	10,000

The following further details are available:

	Total	A	B	C	D	E
Floor space (sq. ft)	10,000	2,000	2,500	3,000	2,000	500
Light points	60	10	15	20	10	5
Direct wages (Rs)	10,000	3,000	2,000	3,000	1,500	500
H.P. of machines	150	60	30	50	10	—
Value of machinery (Rs)	2,50,000	60,000	80,000	1,00,000	5,000	5,000
Working hours	—	6,226	4,028	4,056	—	—

The expenses of D and E are allocated as follows:

	A	B	C	D	E
D	20%	30%	40%	—	10%
E	40%	20%	30%	10%	—

What is the total cost of an article if its raw materials' cost Rs 50, labour costs Rs 30, and it processes through Departments A, B and C for 4, 5 and 3 hours respectively.

Ans: Total overhead of service deptt. D Rs 4,625 and E Rs 1,575. Overhead rates Deptt. A Rs 1.50; B Rs 2.30; and C Rs 2.95.

7. Superfines Ltd. has furnished the following particulars for the half year ending March 31, 2002. Compute the departmental overhead rates for each of the production departments, assuming that the overhead is recovered as percentage of direct wages.

	Production departments			Service departments	
	A	B	C	X	Y
Direct wages	4,000	6,000	8,000	2,000	4,000
Direct material	2,000	4,000	4,000	3,000	3,000
Number of employees	100	150	150	50	50

(contd.)

Electricity (kWh)	8,000	6,000	4,000	2,000	2,000
Light points (No.)	10	16	4	6	4
Asset values (Rs)	1,20,000	80,000	60,000	20,000	20,000
Area occupied (sq. m.)	150	250	100	50	50

The overhead expenses for the above period was:

	Rs
Motive power	3,300
Lighting	400
Stores expenses	800
Staff welfare expenses	4,800
Depreciation	30,000
Repairs	15,000
Rent, rates and taxes	1,200
General expenses	12,000

Apportion the expenses of service department X in proportion of direct wages and that of service department Y in the ratio of 5:3:2 to production departments A, B and C. (ICWA Inter)

Ans: Overhead recovery rates as percentage of direct wages for department, A 671.8%; B 369.7%; C 269.7%.

8. Modern Machines Ltd. have three Production Departments (A, B and C) and two Service Departments (D and E). From the following figures extracted from the records of the company, calculate the overhead rate per labour hour:

	Rs
Indirect materials	15,000
Indirect wages	10,000
Depreciation on machinery	25,000
Depreciation on building	5,000
Rent, rates and taxes	10,000
Electric power for machinery	15,000
Electric power for lighting	500
General expenses	15,000
Total	95,500

Items	Total	A	B	C	D	E
Direct materials	60,000	20,000	10,000	19,000	6,000	5,000
Direct wages	40,000	15,000	15,000	4,000	2,000	4,000
Value of machinery	2,50,000	60,000	1,00,000	40,000	25,000	25,000
Floor area (sq. ft)	50,000	15,000	10,000	10,000	5,000	10,000
Horse power of machines	150	50	60	30	5	5
No. of light points	50	15	10	10	5	10
Labour hours	15,000	5,000	5,000	2,000	1,000	2,000

The expenses of Service Department D and E are to be apportioned as follows:

	A	B	C	D	E
D	40	20	30	-	10
E	30	30	40	-	-

(ICWA Inter)

Ans: Overhead rate per direct labour hour

Deptt. A Rs 8.38

Deptt. B Rs 7.95

Deptt. C Rs 15.44

9. BSG Co. is determining the effect of using various bases for applying factory overhead to production. Their production budget provides the following information:

	Rs
Direct materials	1,00,000
Direct labour (20,000 direct labour hours)	80,000
Depreciation of machinery (5,000 machine hours)	15,000
Indirect materials	20,000
Indirect labour	7,000
Heat, light, power, etc.	10,000
Repairs and maintenance	8,000
	2,40,000

Actual cost and manufacturing data for two jobs is determined at the end of the month:

Job No.	Direct material	Direct labour costs	Direct Labour hours	Machine hour
BK	Rs 5000	Rs 13,000	4,500	1000
CZ	8230	7500	3,000	700

You are required to

- (a) Determine the application rate for overhead based on direct labour costs, direct labour hours, and machine hours.
 (b) Calculate the cost of two jobs using each of the three methods for applying overhead.

Ans:	Total Costs	
Basis	Job BK	Job CZ
1. Direct labour cost	Rs 27,750	Rs 21,355
2. Labour hours	Rs 31,500	Rs 24,730
3. Machine hours	Rs 30,000	Rs 24,130

10. What is machine hour rate? Calculate the machine hour rate for machine A from the following data:

Cost of machine	Rs 16,000	
Estimated scrap value	Rs 1,000	
Effective working life	10,000	hours
Running time for every 4-weekly period	160	hours
Average cost of repairs and maintenances charged per four-week period	Rs 120	
Standing charges allocated to machine A per 4-weekly period	Rs 40	
Power used by machine	4 units per hour at a cost of 5 paise per hour.	

(B. Com. (Hons), Delhi)

Ans: Rs 2.55

11. From the following information relating to the machine "shylack" installed in a factory, work out the machine hour rate.

Purchase price of the machine with scrap value of zero	Rs 90,000
Installation and incidental charges incurred on the machine	Rs 10,000
Life of machine is 10 years of 2,000 working hours each year.	

Repair charges 50% of depreciation. Machine consumes 10 units of electric power per hour @ 10 paise per unit; oil expenses @ Rs 2 per day of eight hours; consumable stores @ Rs 10 per day of eight hours. Two workers are engaged on the machine @ Rs 4 per day of eight hours.

(B. Com. (Hons), Delhi)

Ans: Rs 11

12. Calculate machine hour rate of A Machine:

Consumable stores	Rs 600	for A Machine
Consumable stores	1,000	for B machine
Repairs	800	for A Machine
Repairs	1,200	for B Machine
Heat and light	360	
Rent	1200	
Insurance of building	4,800	
Insurance of machines	800	
Depreciation of machines	700	
Room service	60	
General charge	90	

Additional information:

	Working hours	Area (sq. ft)	Book value (Rs)
A Machine	10,000	100	12,000
B Machine	25,000	500	20,000

(B. Com. Delhi)

Ans: Machine hour rate Rs 0.293.

Hint: (i) Heat and light, rent, insurance of buildings, room service and general charges have been apportioned over machines A and B in the ratio of floor area.

(ii) Insurance of machines has been apportioned over Machines A and B in the ratio of their respective values.

(iii) Depreciation of machines has been apportioned in weighted ratio; Working hours, X value of machinery, calculated as given below:

Machine A : 10000×12000

Machine B : 25000×2000

Or $120 : 500$

= 6 : 25

13. An engineering company, engaged in the manufacture of various heavy engineering products, has installed one Pegard Numerical Control Horizontal Borer for specialised manufacturing operations. Calculate the machine hour rate on the basis of the following particulars:

- (i) F.O.B. cost of machine, Rs 24 lakhs. (ii) Customs duty, insurance, freight, etc. Rs 11 lakhs. (iii) Installation expenses Rs 3 lakhs. (iv) Cost of tools adequate for 2 years only Rs 4 lakhs. (v) Cost of machine room Rs 3 lakhs. (vi) Cost of air-conditioning for machine room Rs 2 lakhs. (vii) Rate of interest on term loan to finance the above capital expenditure 12% per annum. (viii) Salaries, etc. for operators and supervisory staff Rs 2 lakhs per year. (ix) Cost of electricity Rs 11 per hour. (x) Consumption of stores Rs 5,000 per month. (xi) Other expenses Rs 5 lakhs per annum. (xii) Assume rate of depreciation as 10% per annum on fixed assets. (xiii) Total working hour in the machine room is 200 hours in a month. (xiv) Loading and unloading time is 10% of machine time. (xv) You can make suitable assumptions, if necessary, for the purpose of your computation.

(ICWA Inter)

Ans: Rs 915.20

14. Sigma Products Ltd. used three identical large and six identical small machines. The working hours of each of the nine machines are 1,800 hours per year, while the effective working life is taken as 20,000 hours for each large machine and 12,000 hours for each small machine. The cost of each large machine is Rs 10,300 and small machine Rs 3,100. Scrap values are Rs 300 and Rs 100 respectively. Each large machine occupies one sixth of the workshop and fully employs six workers, each small machine occupies 1/12 of the workshop and fully employs four workers. Large machine consumes 5 units of electric power per hour and small machine 1 unit per hour. The cost per unit is six paise. Repairs, maintenance, oil, etc., are estimated to cost for each large machine Rs 2,500 and each small machine Rs 750 during its effective life. The manager is paid Rs 450 per month and workshop supervision occupies half of his time, which is divided equally among the nine machines.

Other expenses incurred during the month are as under:

Rent of workshop	Rs 600
Lighting (to be apportioned in the ratio of workers employed)	126
Insurance-large machine	6.0
Insurance-each small machine	4.5

Taking a period of one month as basis, calculate the machine-hour rate for a large and a small machine separately.

Ans: Machine hour rate

Large Machine Rs 1.918

Small Machine Rs 0.982

15. A cost centre in a factory furnishes the following working conditions:

Normal working hours per week	40 hours
Number of machines	15
Normal weekly loss of hours on maintenance, etc.	4 hours per machine
Estimated annual overhead	Rs 1,55,520
Estimated direct wages rate	Rs 3 per hour
Number of weeks worked per year	48
Actual results in respect of a 4-week period are:	
Overhead incurred	Rs 15,000
Wages incurred	Rs 7,000
Machine hours produced	2,200

You are required to: (a) calculate the overhead rate per machine hour; and (b) the amount of under/over-absorption of both wages and overhead. (CA Inter)

Ans: (a) Rs 6; (b) overhead under-absorbed Rs 1,800; and wages over-absorbed Rs 200.

16. Compute the machine hour rate from the following data:

(i) Total machine cost to be depreciated	Rs 2,30,000
(ii) Life 10 years.	
(iii) Depreciation on straight line	
(iv) Departmental overheads (annual)	
Rent	Rs 50,000
Heat and lighting	Rs 20,000
Supervision	Rs 1,30,000
(v) Department area	70,000 sq ft
Machine area	2,500 sq ft
(vi) 26 machines in the department	
(vii) Annual cost of reserve equipment for the machines	1,500
(viii) Hours run on production	1,800

- (ix) Hours for setting and adjusting 200
 (x) Power cost Re 0.50 per hour of running time
 (xi) Labour (a) when setting and adjusting, full time attention; (b) when machine is producing; one man can look after 3 machines.
 (xii) Labour rate Rs 6 per hour (CA Inter)

Ans: Machine hour rate Rs 20.14

17. (a) From the following data for the month of March 2002, compute the machine hour rate to be charged in respect of a job carried out during the month on a printing machine in a job printing press:
- | | |
|--|-----------|
| (i) Cost of the printing machine | Rs 77,000 |
| (ii) Estimate life of machine | 10 years |
| (iii) Anticipated scrap value at the end of 10 years | Rs 5,000 |
| (iv) Normal working hours per month | 600 |
| (v) Hours run on trial runs and job setting | 20 |
| (vi) Hours lost due to repairs (normal) | 50 |
| (vii) Hours lost due to power failure (abnormal) | 80 |
| (viii) Cost of maintenance | 3,300 |
| (ix) Supervisors' salary | 800 |
| (x) Cost of printing ink, etc. | 2,400 |
| (xi) Electricity charges | 720 |
| (xii) Other fixed charges | 3,000 |
| (xiii) Overtime hours worked to complete job on time | 100 |
| (xiv) Rate of wages per hour (normal) | 8 |
| (xv) Rate of wages per hour (overtime) | 12 |
| (xvi) Rate of wages per hour (during power failure) | 4 |
- (b) If you were to quote for a job to be executed in July 2002 requiring 300 machine hours, to what extent, if any, would be guided by the machine hour rate of March 2002. (ICWA Inter)
- Give reason for your answer.

Ans: (a) Machine hour rate Rs 16.55

- (b) Since there are equal number of days in March and July, the machine hour rate of March can be used for quoting the price of a job in the month of July 2002. However, adjustment may have to be made if there is any change in the variable costs such as ink, electricity charges, etc.

18. In a light engineering factory, the machine shop consists of three cost centres (A, B and C) each having three distinct sets of machines. The following are the details of estimates for the year 2001:

	Total	A	B	C
1. No. of workers	800	200	200	400
2. No. of machine hours	1,00,000	30,000	30,000	40,000
3. % of horse power	.100	40	25	35
		(Amount in lakhs of Rs)		
4. Value of assets	40.00	10.00	16.00	14.00
5. Direct wages	30.00	8.00	10.00	12.00
6. Depreciation	4.00			
7. Indirect labour	9.00			
8. Insurance charges	2.00			
9. Electricity	3.00			
10. Supervisory salaries	1.60			
11. Staff welfare expenses	3.00			
12. Other expenses	6.00			

Work out a composite machine hour rate for each of the three cost centres and indicate clearly the basis of apportionment of expenses between the cost centres. (ICWA Inter)

Ans: Machine hour rate:

Dept. A = Rs 53.50; B = Rs 63.67; C = Rs 58.63.

19. A department is having three machines. The figures indicate the departmental expenses. Calculate the machine hour rate in respect of these machines from the information given below:

	Rs
Depreciation of machinery	12,000
Depreciation of building	2,880
Repairs to machinery	4,000
Insurance of machinery	800
Direct wages	6,000
Power	6,000
Lighting	800
Miscellaneous expenditure	4,200
	37,480

	<i>Machine I</i>	<i>Machine II</i>	<i>Machine III</i>
Direct wages	Rs 1,200	Rs 2,400	Rs 2,400
Power units	30,000	10,000	20,000
Number of workers	4	8	8
Light points	8	24	48
Space	400 sq. ft	800 sq. ft	800 sq. ft
Cost of machine	Rs 3,00,000	Rs 1,20,000	Rs 1,80,000
Hours worked	200	300	300

(ICWA Inter)

Ans: Machine I Rs 76.48; Machine II Rs 40.77; Machine III Rs 50.51.

20. Sankalp Industries absorbs factory overhead costs at Rs 2.50 per direct labour hour. Both opening and closing balance of work-in progress and finished goods inventories are zero.

The following data are available for the year 2002 and the fact that all goods produced have been sold:

Direct labour hours used	50,000
Direct labour cost	Rs 1,00,000
Indirect labour cost	25,000
Indirect materials cost	10,000
Depreciation of plant and equipment	50,000
Miscellaneous factory overheads	50,000

Assuming that all goods produced have been sold—

- (i) Calculate factory overheads incurred and factory overheads absorbed; and
 (ii) Pass a journal entry for disposing of overhead or under-absorbed factory overheads.

(B. Com. (Hons), Delhi)

Ans: Factory overhead incurred Rs 1,35,000
 Factory overhead absorbed Rs 1,25,000

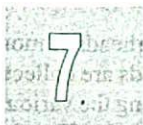
Plus supplementary overhead rate Rs $\frac{10000}{50000 \text{ hrs}}$ = Re 0.20 per hour

21. Separate departmental overhead application rates based on direct labour hours are being used by a manufacturing company. At the end of the year, the following information is supplied to you.

	Deptt. I	Deptt. II	Deptt. III
Overhead absorption rates used	Rs 4.00	3.00	7.00
Actual overhead incurred	81,900	1,20,960	79,360
Overhead absorbed	72,800	1,00,800	86,800
Direct labour hours recorded:			
Work-in-progress	2,800	4,930	820
Finished goods stock	5,400	3,700	1,210

- (a) Calculate the revised overhead application rate in rupees per direct labour hour (to the nearest rupee) in the light of actual figures for the year supplied to you.
- (b) Calculate also the total amounts by which the work-in-progress and finished goods stock in each department will have to be increased in the light of the revision of the overhead application rate.

(ICWA Inter)



Administrative and Selling and Distribution Overheads

The previous Chapter 6 has discussed factory overhead and its distribution among products and jobs. This chapter focuses on administrative overheads, selling and distribution overheads and treatment of some items of expenses in cost accounting.

ADMINISTRATIVE OVERHEADS

Administrative overheads are those expenses which are incurred for formulating the policy, directing the organisation and controlling the operations of an undertaking. In other words, administrative overheads are incurred for general management and control of the organisation. Administrative overheads include the following items of overheads:

A *Indirect material:*

1. Printing and stationery used in the office.
2. Cost of brushes, dusters and other office supplies.

B *Indirect labour*

1. Salaries, allowances, fees of board of directors, managing director, chairman, board staff, cost accountant, accounts manager and his staff, secretary and his staff, treasurer and his staff.
2. Salaries, allowances, fees of legal adviser and his staff, public relations officer and his staff, remuneration of internal auditors and statutory auditors.

C. *Indirect expenses:*

1. Office rent, rates and insurance
2. Office lighting, heating and cleaning
3. Depreciation and repairs of office buildings, furniture and fittings
4. Legal charges
5. Bank charges
6. Trade subscriptions and donations
7. Miscellaneous office expenses

There is lesser fluctuations in the amounts of administrative overheads as compared to factory overheads which may change largely in relation to changes in output.

Distribution of Administrative Overheads

The method of distributing administrative overheads is more or less the same as in the case of factory overheads. All items of administrative overheads are collected and grouped under proper classification heads. The overheads are then apportioned among the various administrative departments (cost centres). Some examples of administrative departments are office department, accounts department, personnel department, secretarial department, law department. Those administrative overheads which can be identified with specific departments are directly allocated to them. The remaining administrative overheads are apportioned among those administrative departments for which they have been incurred, on an equitable basis.

A single rate for the total administrative overheads may be obtained without going into details of these overheads incurred for various departments. The Administrative Overhead Rate may be computed using any one of the following bases:

- (1) As a percentage of Factory Cost: $\frac{\text{Total Administrative Overhead}}{\text{Total Factory Cost}} \times 100$
- (2) As a percentage of Factory Overheads: $\frac{\text{Total Administrative Overhead}}{\text{Total Factory Overhead}} \times 100$
- (3) As a percentage of Sales: $\frac{\text{Total Administrative Overhead}}{\text{Total Sales}} \times 100$
- (4) As a percentage of Gross Profit: $\frac{\text{Total Administrative Overhead}}{\text{Gross Profit}} \times 100$
- (5) As a percentage of Conversion Costs: $\frac{\text{Total Administrative Overhead}}{\text{Total conversion Costs}} \times 100$

Conversion cost include the cost of direct labour, direct expenses and factory overheads.

The above treatment, i.e. calculating an administrative overhead rate for charging administrative overheads, is based on the assumption that administrative overheads are an additional and separate element of cost of a product or job.

Besides the above treatment, the following two procedures are also suggested to deal with the administrative overheads:

1. *Apportionment between production and selling divisions* Under this method administrative overheads are divided between production and selling divisions on some suitable basis. After such distribution, administrative overheads lose their identity. This method follows the logic that an organisation has only two functions to perform, namely production and selling.
2. *Transfer to costing profit and loss account* Under this method, administrative overheads are transferred to Costing Profit and Loss Account. This method is based on the assumption that administrative overheads are not directly concerned with the production function of the organisation and therefore should not be included in the cost of production. This method reduces the cost of product or job.

SELLING AND DISTRIBUTION OVERHEADS

Selling overheads include the costs incurred in promoting sales and retaining customers. Distribution overheads include the costs of the process which begins with making the packed product available for despatch and ends with making the reconditioned returned empty packages available for reuse. Distribution overheads strictly begin when an order has been obtained and generally ends when goods are to be despatched.

Broadly, selling overheads include the following items.

- (a) *Indirect materials* They include cost of printing and stationery, mailing literature, catalogue, price lists etc.
- (b) *Indirect labour* This includes salaries, commission, allowances etc. of salesman, representative, sales manager, marketing manager etc.
- (c) *Indirect expenses* Advertising, bad debts, rent of showroom, insurance of showroom, collection charges, travelling and entertainment expenses, expenses of branch establishment, sales office expenses, fees of directors who devote time to sales function, are some examples of indirect expenses.

Broadly, distribution overheads include the following items:

- (a) *Indirect materials* Cost of packing cases; oil, grease, spare parts used in maintenance of delivery vehicles.
- (b) *Indirect labour* Wages of packers, van drivers, despatch clerks, etc.
- (c) *Indirect expenses* Godown expenses including rent, insurance, freight, carriage outwards and other transport charges, depreciation and running expenses of delivery vans.

Apportionment of Selling and Distribution Overheads

Although, selling and distribution overheads differ in nature with each other, for the purpose of apportionment and absorption, both the overheads can be taken together. Selling and distribution overheads should be classified into two groups in order to charge them finally to products:

- (a) *Direct overheads* Direct overheads are the overheads which can be directly identified with a particular product or products. For example, sales promotion expenses or transport charges incurred for a product should be charged directly to that product only.
- (b) *Indirect overheads* These are such selling and distribution overheads which can not be identified with particular product or products. Such indirect overheads are apportioned using the following steps:
 - (1) *Collection and classification of overheads*—All selling and distribution overheads should be collected and classified according to their nature into certain groups such as advertising, exhibition, bad debts, depreciation of vehicles used for sale, discount, freight, heating, insurance, lighting, packing, postage, commission, rent repairs, etc.
 - (2) *Apportionment of overheads*—After collecting and classifying overheads, they should be further allocated to one or more cost centres or departments or functions to which they relate. If any item (items) of overheads cannot be totally transferred to a particular department or functions it should be apportioned among the departments or functions on an equitable basis for which they have been incurred. Some examples of apportionment of overheads in terms of functions (or departments) are the following:

- (i) *Direct selling*—This includes overheads such as expenses incurred on sales executive, sales staff, sales office expenses, etc.
- (ii) *Advertisement and sales promotion*—This includes expenses incurred on exhibition, posters, cinema slides, distribution of samples, etc.
- (iii) *Credit and collection*—This includes costs incurred on debt collection, bad debts, legal costs.
- (iv) *Transportation*—Costs such as insurance for goods in transit, demurrage, maintenance staff, depreciation of transport vehicles are included in this group.
- (v) *Warehousing and storage costs*—This includes expenses incurred on secondary packing for storage, warehouse rent, internal transport, insurance, etc.
- (vi) *General administration*—This includes costs such as royalty on sales, sales invoicing, maintenance of accounts, cost of investment in stocks.

The above costs which belong to different cost centres are subsequently apportioned to various areas or territories or zones on an equitable basis as shown in Fig. 7.1

Function	Basis of apportionment	Total Rs	Territories			
			I East zone	II West zone	III North zone	IV South zone
1. Direct selling	Allocation					
2. Advertising and sales promotion	Sales value					
3. Credit & Collection	No. of orders or Cash collected					
4. Transportation	Sales value					
5. Warehousing	Sales value					
6. General administration	No. of orders or No. of invoices or Sales value					

Fig. 7.1

- (3) *Absorption of overheads* After apportionment of overheads, selling and distribution overheads of each territory, or zone or area are charged to different products sold in that area or territory on a suitable basis. This may be done by one or more of the following methods:
- (i) *Rate per article*—If this method is adopted, the overhead costs are divided by the number of products sold in that territory during a certain period.
 - (ii) *A percentage of sales*—This is suitable for apportionment of direct selling costs, general administration, finance costs, etc. If selling overhead of a sales zone is Rs 50,000 and the sales of that zone are Rs 2,00,000, an addition should be made to the cost of products by 25% of the selling price of that product.
 - (iii) *A percentage of works cost*—Where selling overheads are small, this method can be adopted, even though various articles are produced, as little advantage would be gained by using a more complicated system.

- (iv) A percentage of cash collected—This method may be used for apportionment of credit and collection costs such as bad debts, legal expenses, etc.

Example 7.1

Following data is available relating to a company for a certain month:

	I	Territory II	III
Selling expenses	Rs 7,600	Rs 4,200	Rs 6,240
Distribution costs	Rs 4,000	Rs 1,800	Rs 2,000
No. of units sold	Rs 16,000	Rs 6,000	Rs 10,000
Sales	Rs 76,000	Rs 28,000	Rs 52,000

The company adopts sales basis and quantity basis for application of selling and distribution costs, respectively. Compute (a) The territory-wise overhead recovery rates separately for selling and distribution costs, and (b) the amounts of selling and distribution costs chargeable to a consignment of 2,000 units of a product, sold in each territory at Rs 4.50 per unit. (ICWA Inter)

Solution**(a) Computation of Overhead Recovery Rates**

$$1. \text{ Selling Cost Recovery Rate} = \frac{\text{Selling Expenses}}{\text{Sales}} \times 100$$

$$2. \text{ Distribution Cost Recovery Rate} = \frac{\text{Distribution Costs}}{\text{No. of Units Sold}}$$

Territory	Selling Cost Recovery Rate	Distribution Cost Recovery Rate
I	$\frac{\text{Rs } 7,600}{\text{Rs } 76,000} \times 100 = 10\% \text{ on sales}$	Rs $\frac{4,000}{16,000} = 25 \text{ paise per unit}$
II	$\frac{\text{Rs } 4,200}{\text{Rs } 28,000} \times 100 = 15\% \text{ on sales}$	Rs $\frac{1,800}{6,000} = 30 \text{ paise per unit}$
III	$\frac{\text{Rs } 6,240}{\text{Rs } 52,000} \times 100 = 12\% \text{ on sales}$	Rs $\frac{2,000}{10,000} = 20 \text{ paise per unit}$

(b) Computation of Selling and Distribution Costs Chargeable to Consignment

Territory	I	II	III
No. of units sold	2,000	2,000	2,000
Sales at Rs 4.50 per unit	9,000	Rs 9,000	Rs 9,000
Selling cost chargeable	900.00	Rs 1,350.00	Rs 1,080.00
Distribution cost chargeable	500.00	Rs 600.00	Rs 400.00
Total	Rs 1,400.00	Rs 1,950.00	Rs 1,480.00

Example 7.2

XYZ Ltd. a manufacturing company, having an extensive marketing network throughout the country, sells its products throughout four zonal sales offices, viz. A, B, C, and D. The budgeted expenditure for January 2002 are given below:

	Rs
Sales Manager's salary	1,20,000
Expenses relating to Sales Manager's office	80,000
Travelling salesman's salaries	3,20,000
Travelling expenses	36,000
Advertisements	30,000
Godown Rent: Zone	
'A'	15,000
'B'	25,200
'C'	9,800
'D'	18,000
	68,000
Insurance on inventories	20,000
Commission on sales @ 5% on Sales	6,00,000

The following further particulars are also available:

Zone	Sales in Rs lakhs	No. of salesmen	Total mileage covered	Allocation of advertisement	Average stock in Rs lakhs
A	36	5	6,000	30%	6
B	48	6	14,000	30%	8
C	16	2	4,500	20%	4
D	20	3	5,500	20%	2

Based on the above details, compute zonewise selling overheads, as a percentage to sales.

(ICWA Inter)

Solution

**Books of XYZ Ltd.
Computation of Zonewise Selling Overhead Rates**

Items of expense	Basis of charge	Total Rs	Zones			
			A Rs	B Rs	C Rs	D Rs
Sales Manager's salary	Sales	1,20,000	36,000	48,000	16,000	20,000
Sales manager's office exp.	Sales	80,000	24,000	32,000	10,667	13,333
Salesmen's salaries	No. of Salesmen	3,20,000	1,00,000	1,20,000	40,000	60,000
Travelling expenses	Mileage covered	36,000	7,200	16,800	5,400	6,600
Advertisement	Budgeted ratio	30,000	9,000	9,000	6,000	6,000
Godown rent	Actuals	68,000	15,000	25,200	9,800	18,000
Insurance	Average inventory	20,000	6,000	8,000	4,000	2,000
Commission on sales	Sales	6,00,000	1,80,000	2,40,000	80,000	1,00,000
Total overheads		12,74,400	3,77,200	4,99,000	1,71,867	2,25,933

(contd)

Items of expense	Basis of charge	Total Rs	Zones			
			A Rs	B Rs	C Rs	D Rs
Amount of sales		1,20,00,000	36,00,000	48,00,000	16,00,000	20,00,000
Overheads as a percentage of sales =	$\frac{\text{Overhead}}{\text{Sales}} \times 100$	10.62%	10.48%	10.40%	10.74%	11.30%

Example 7.3

The XYZ Co. operates a standard cost system in connection with its manufacturing operations. It produces Products A, B and C whose standard manufacturing costs per unit are as follows:

	A Rs	B Rs	C Rs
Fixed	1.00	0.50	2.00
Variable	1.00	2.50	1.00
Total	2.00	3.00	3.00

The company's selling and distribution costs are high and the company's profit have been declining. Selling and distribution costs for the period just ended are summarised below:

	Rs
Advertising	4,000
Direct selling	12,000
General office expenses (related to sales)	3480
Ordering and billing	2450
Packing	3600
Storage	5060

Additional data concerning the company's operations are:

	A	B	C
Advertising space	30%	40%	30%
Average time in storage	10 days	20 days	12 days
No. of invoice line	80	40	160
Sales volume	Rs 24,000	18,000	18,000
Space occupied per unit of product	1 cu. ft	2 cu. ft	1/2 cu. ft
Salesmen's time	40%	30%	30%
Time required for packing		3/4 A	1/4 A
Units sold	4000	2000	2000

You are required to:

- Prepare an analysis of selling and distribution cost by Products A, B and C.
- Prepare an income statement for each product based on standard manufacturing costs and the analysis just completed.

(ICWA Inter)

Solution

(a) Statement of Analysis of Selling and Distribution Costs

Particulars	Basis of apportionment	Total Rs	A Rs	B Rs	C Rs
Advertising	As per % given in the question	4,000	1,200	1,600	1,200
Direct selling	Salesmen's time	12,000	4,800	3,600	3,600
General office exp.	Sales	3,480	1,392	1,044	1,044
Ordering and billing	No. of invoice lines	2,450	700	350	1,400
Packing	Composite ratio of space occupied × units sold × Time required for Packing 4000 : 3000 : 250	3,600	1,986	1,490	124
Storage	See note below	5,060	1,533	3,067	460
Total:		30,590	11,611	11,151	7,828

Note:

	Storage :
	Time × space × units sold
A	$10 \times 1 \times 4000 = 40,000$
B	$20 \times 2 \times 2000 = 80,000$
C	$12 \times 1/2 \times 2000 = 12,000$, i.e. 40:80:12 ratio

(b) Income Statement

Particulars	A Rs	B Rs	C Rs	Total Rs
Units sold	4,000	2,000	2,000	8,000
A. Sales	24,000	18,000	18,000	60,000
B. Manufacturing Cost:				
Fixed	4,000	1,000	4,000	9,000
Variable	4,000	5,000	2,000	11,000
Total: B	8,000	6,000	6,000	20,000
C. Gross profit (A-B)	16,000	12,000	12,000	40,000
D. Less: Selling & Distribution cost	11,611	11,151	7,828	30,590
E. Income	4,389	849	4,172	9,410

Example 7.4

A company manufacturing a sole product sells it through three salesmen, A, B and C stationed in three regions. Besides, sales are also effected through a sales depot situated at the company's headquarters. The following information is obtained from the books of the company for December 2002.

Sales	Rs 4 lakhs
Cost of sales	2.50 lakhs
Gross profit	1.50 lakhs, 37.5% of sales
Selling expenses:	
Salesmen's salaries	Rs 3,500

Commission	22,000
Travelling expenses	9,000
Advertisement expenses	60,000
Other selling expenses	35,500
	Rs 1,30,000

Net profit Rs 20,000, 5% of sales

The management is not satisfied with the net profit and asks you to investigate. You find that salesman B and C are paid salaries at Rs 1,500 and Rs 2,000 per month respectively besides a commission of 5% on sales. The salesman, A, however, receives a commission of 10% on sales but no salary. Travelling expenses paid were Rs 2,000, Rs 4,000 and Rs 3,000 respectively for A, B and C. Advertising expenses were apportioned equally to A, B and C, after deducting a sum of Rs 3,000 spent in headquarters. Other selling expenses for headquarters amounted to Rs 17,500, the rest being apportioned to A, B and C, on the basis of sales. The break-up of the sales was as follows:

Headquarters	Rs 40,000
Salesman A	80,000
B	1,20,000
C	1,60,000

Prepare a statement showing the individual profit or loss from each salesman. Comment on the results indicating your suggestions for improving the position. (ICWA Inter)

Solution

Statement of Profit and Loss

Items	Total	Headquarters	Salesman		
			A	B	C
Sales	Rs 4,00,000	Rs 40,000	Rs 80,000	Rs 1,20,000	Rs 1,60,000
Less: Cost of sales (62.5% of sales)	2,50,000	25,000	50,000	75,000	1,00,000
Gross Profit	1,50,000	15,000	30,000	45,000	60,000
Salaries	3,500	—	—	1,500	2,000
Commission	22,000	—	8,000	6,000	8,000
Travelling	9,000	—	2,000	4,000	3,000
Advertising	60,000	3,000	19,000	19,000	19,000
Other selling expenses	35,500	17,500	4,000	6,000	8,000
	1,30,000	20,500	33,000	36,500	40,000
Net Profit	20,000	- 5,500	- 3,000	8,500	20,000

According to the statement, the headquarters and the salesman A are showing a net loss of Rs 5,500 and Rs 3,000 respectively. In the case of headquarters, for a gross profit of Rs 15,000 the selling expenses are Rs 20,500, besides the sales being only Rs 40,000. In spite of Rs 19,000 being spent on advertisement, the sales of the salesman A are only Rs 80,000. The existing state of affairs at the headquarters may be corrected by cutting down selling costs or stop it from selling anything at all. In the case of the salesman A, attempt should be made to push up or change the salesman himself. If possible, the sales territory in charge of A may be closed down and attempts may be made to push up the sales of the other two territories.

Example 7.5

A company is supplying its products to the ultimate consumers through the wholesalers to retailers. The Managing Director thinks that if they sell through the retailers or to the consumers direct, they can increase their sales, earn better prices, and make more profit. As a cost accountant of the company, you are required to advise the Managing Director in selecting the channels of distribution from the following information:

Channels of distribution	1	2	3
	To consumer direct	To retailer direct	To wholesaler
Sale price per unit (Rs)	9.50	8.50	7.25
Estimated sales per year (Nos.)	6,00,000	5,70,000	5,40,000
Selling and distribution cost per unit (Rs)	3	1.60	0.90
Cost of product:			
Variable cost @ Rs 4 per unit			
Fixed cost Rs 5,00,000			

In selecting the channels of distribution, what factor besides cost would you consider?

Solution

Profit and Loss Statement

	Channels of Distribution		
	1	2	3
	To consumer	To retailer	To wholesaler
Cost of production:	Rs	Rs	Rs
Variable	4.00	4.00	4.00
Fixed	0.83	0.88	0.93
	<u>4.83</u>	<u>4.88</u>	<u>4.93</u>
Selling and distribution cost:	3.00	1.60	0.90
Cost of sales	<u>7.83</u>	<u>6.48</u>	<u>5.83</u>
Sales	9.50	8.50	7.25
Net profit	<u>1.67</u>	<u>2.02</u>	<u>1.42</u>

Channel 2 gives the highest profit. In selecting the channels, besides cost, factors such as, the nature of the product, the demand for it, the type of customers and the possibility for expansion, etc. should also be considered.

Example 7.6

A company is making a study of the relative profitability of the two products—A and B. In addition to direct costs, indirect selling and distribution costs to be allocated between the two products are as under:

Particulars	Rs
Insurance Charges for Inventory (finished)	78,000
Storage Costs	1,40,000
Packing and Forwarding Charges	7,20,000
Salesman Salaries	8,50,000
Invoicing Costs	4,50,000

Other details are:

Particulars		Product A	Product B
Selling Price per unit	(Rs)	500	1,000
Cost per unit (exclusive of indirect selling and Distribution Costs)	(Rs)	300	600
Annual Sales in units		10,000	8,000
Average Inventory	(units)	1,000	800
Number of Invoices		2,500	2,000

One unit of product A requires a storage space twice as much as product B. The cost of packing and forward one unit is the same for both the products. Salesman are paid salary plus commission @ 5% on sales and equal amount of efforts are put forth on the sales of each of the products.

Required:

- Set up a schedule showing the apportionment of the indirect selling and distribution costs between the two products.
- Prepare a statement showing the relative profitability of the two products.

(CA Inter, May 1996)

Solution

(i) Statement of Apportionment of Indirect Selling and Distribution Costs

Items	Basis of Apportionment	Total Rs	Products	
			A Rs	B Rs
Insurance Charges	Average Inventory Value (1,000 × Rs 500) : (800 × Rs 100)	78,000	30,000	48,000
Storage Cost	Average Inventory Storage Space (1000 × 2) : (800 × 1)	1,40,000	1,00,000	40,000
Packing & Forwarding Charges	Annual Sales in units (10 : 8)	7,20,000	4,00,000	3,20,000
Salesmen Salaries	Efforts of Salesmen (1 : 1)	8,50,000	4,25,000	4,25,000
Salesmen Commission	(Annual Sales Value) (5 : 8)	6,50,000	2,50,000	4,00,000
Invoicing Costs	No. of Invoices (25 : 20)	4,50,000	2,50,000	2,00,000
		<u>28,88,000</u>	<u>14,55,000</u>	<u>14,33,000</u>

(ii) Statement Showing the Relative Profitability of the Products

Products	A Rs	B Rs
Annual Sales Value	50,00,000 (10,000 units × Rs 500)	80,00,000 (8,000 units × Rs 1,000)

(contd)

Less: Cost of Sales	30,00,000 (10,000 units × Rs 300)	48,00,000 (8,000 units × Rs 600)
Gross Profit:	20,00,000	32,00,000
Less: Indirect Selling & Distribution Cost	14,55,000	14,33,000
[Refer to (i) above]		
Profit	<u>5,45,000</u>	<u>17,67,000</u>
Profitability as Percentage of Sales	10.9%	22.8%
	$\left(\frac{\text{Rs } 5,45,000}{\text{Rs } 50,00,000} \times 100 \right)$	$\left(\frac{\text{Rs } 17,67,000}{\text{Rs } 80,00,000} \times 100 \right)$

TREATMENT OF SOME ITEMS OF EXPENSES

Interest on Capital

There is a difference of opinion as to whether interest on capital employed in manufacture should be treated as an item of cost.

The following arguments are advanced to support of treating interest as an item of costs:

1. Interest is the reward of capital just as wages are the reward of labour. Profit, in the true sense, cannot be computed without considering interest.
2. The comparison of operations, different processes, etc. without due consideration of the interest factor, may lead to unreliable conclusions.
3. Interest considers time factors as it is computed on the basis of time and time is regarded as an important factor in production.
4. The inclusion of interest is of particular importance where articles of different values are produced and the capital invested in each product line differs considerably.
5. The cost of carrying inventory cannot be determined without giving due recognition to the interest on capital employed in it.

The following arguments are against including interest in the cost accounts:

1. Cost accounting considers only actual expenditures and can include only interest paid.
2. The interest factor is in no way connected with cost of manufacture. Whatever may be the method of raising finances—owned capital, loans, debentures, etc. does not affect manufacturing cost. It only affects the profits of the period.
3. Inclusion of interest in product costing will inflate the values of inventory and work-in-progress and therefore will tend to increase the profit unreasonably.
4. Interest is calculated on capital and the term “capital” has many concepts such as total capital employed in business, equity capital and borrowed capital both.
5. A reliable and correct rate of interest is difficult to determine and is likely to be influenced by naked fluctuations.
6. The cost accounting and product costing systems get complicated unnecessarily by inclusion of interest on capital and financial statements also become misleading.

There is one point upon which opinion is not divided. If interest is to be considered at all, it must not be confined merely to such interest as may actually have been paid by the business. In other words, interest should be ignored entirely or else included in respect of the whole capital employed, whether such capital requires the payment of interest or not. Therefore, if it is decided to exclude interest from the cost accounts, interest which has been paid, must also be ignored.

Of late, cost accountants in India tend to agree that interest on capital or funds borrowed from outside and paid or to be paid in cash should be included in product cost. This has been supported on the grounds that it implies cash outflow and affects the operating results of a business firm. The Bureau of Industrial Costs and Prices in India includes actual interest on borrowed funds as an element of cost in cost price studies. However, the Bureau does not consider the notional type of interest (interest on owned capital) as an element of cost.

Depreciation

Depreciation is the diminution in the value of fixed assets due to use and/or the lapse of time. The following are the methods of depreciation.

1. *Straight line method* This method provides for depreciation by means of equal periodic charges over the life of the asset. For example, suppose the cost of a plant is Rs 1,00,000 and its life is 10 years. Then the charge of depreciation per annum will be Rs 10,000.
2. *Diminishing balance method* This method tends to write-off higher amounts in the beginning and comparatively lower amounts in subsequent parts of the life of an asset. The amount of depreciation is calculated at a constant rate at the balance of the value of the asset after deducting the amounts of depreciation previously provided. For example, taking the above illustration, the amounts of depreciation at the rate of 10% p.a. would be Rs 10,000 for the first year, Rs 9,000 for the second year, Rs 8,100 for the third year, and so on.
3. *Production unit method* This method charges the amount of depreciation by means of fixed rate per unit of production calculated by dividing the value of the asset by the estimated number of units to be produced during its life. The formula for calculating depreciation under this method is as follows:

$$\text{Depreciation (per unit)} = \frac{\text{Original cost-residual value}}{\text{Estimated output during its life}}$$

4. *Annuity method* This method assumes that the capital used in the purchase of plant should have earned interest if invested somewhere else. The amount of depreciation in this method is calculated by dividing the aggregate of the cost of the asset depreciated and interest at a given rate, at a constant rate, on the written down value of the asset.
5. *Sinking fund method* Under the annuity method, expected interest on the investment (equivalent to the cost of the asset) is assumed. However, no actual investment is made. But under the sinking fund method, the amount of depreciation written off every year is invested in some securities, which would accumulate at compound interest to provide, at the end of the life of the asset, a sum equal to its cost. This method provides for depreciation of fixed periodic charges.
6. *Endowment policy method* This method is similar to the sinking fund method. It provides for depreciation by means of fixed periodic charges equivalent to the premium on an endowment policy for the amount required to provide, at the end of the life of the asset, a sum equal to its cost.

The amount of depreciation is equivalent to the premium payable on the policy.

7. *Production hour method* This method provides for depreciation by means of a fixed rate per hour of production by using the following formula:

$$\text{Depreciation (per unit)} = \frac{\text{Cost of the asset}}{\text{Estimated number of working hours of its life}}$$

8. *Sum-of-the year digits method* This method provides for depreciation by means of differing periodic rates computed according to the following formula. If n is the estimated life of the asset, the rate is calculated for each period as a fraction in which the denominator is always the sum of the series 1, 2, 3, ... n and the numerator for the first period is n , for the second period is $n-1$, and so on.

Rent

The rent payable by a manufacturer or businessman who does not have his own building is undoubtedly an expense which must be charged to production. In many cases, however, the premises are owned by the business and no rent is paid. In such circumstances, a charge in lieu of rent should be made in the cost accounts in order that the true cost of production may be ascertained.

Capacity

The term "capacity" signifies volume capacity of a business enterprise. It can be measured in the following manner:

1. *Maximum theoretical capacity* It is that capacity of a plant or department which will be achieved under 100% operating time. It assumes round-the-clock operation of all plants with no allowance for machine downtime, waits and delays or holidays. It cannot be achieved in reality.
2. *Practical capacity* The practical capacity of a plant is the theoretical maximum capacity less normal and unavoidable operating interruption, such as repairs, wait, breaks, machine failure, etc.
3. *Normal activity or capacity* Normal capacity involves consideration of both the ability to produce and the ability to sell. For this, a sales budget is prepared which determines normal activity. This is a long-term measure that represents the practical plant capacity less the estimated idle capacity.
4. *Expected activity or capacity* This capacity indicates the activity budgeted for the current year. It can be more or less than the normal activity level, but will never be more than the practical capacity. It is similar to normal capacity but for a short period of time.

The normal capacity concept is generally the most suitable for product cost determinations which further help in determining selling prices and valuation of inventories for purposes of financial statements. Expected capacity level tends to increase product unit costs when lower output than normal capacity output is achieved.

Idle Capacity

Idle capacity denotes that plant, machinery and equipments are available for manufacturing or other purposes, but are not being used totally. The Institute of Cost and Management Accountants (U.K.)

defines idle capacity cost as "the cost of abnormal idleness of fixed assets or available services." Idle capacity is the difference between the normal capacity and capacity utilised based on expected sales. For example, if the normal capacity of a plant is to produce 50,000 units a month, but the plant is being used to manufacture only 40,000 units per month due to some reason (say, a low market demand of the product), then, in such a situation 10,000 units will be treated as the idle capacity of the plant. The idle capacity may arise due to lack of product demand, non-availability of raw materials, shortage of skilled labour, absenteeism, shortage of power, fuel or supplies, seasonal nature of the product, etc.

Idle capacity costs are mostly fixed in nature and are to be incurred because of unused capacity. Such costs consist of depreciation, maintenance, insurance premium, rent, property taxes, certain utilities, management and supervisory salaries and similar annual expenses. These costs remain unabsorbed or unrecovered due to under-utilisation of plant capacity. Idle capacity cost can be computed in the following manner:

$$\text{Idle capacity cost} = \text{Idle capacity} \times \frac{\text{Total overhead related to a plant}}{\text{Normal plant capacity}}$$

Idle capacity cost can be divided into normal and abnormal idle capacity cost. Under normal circumstances such as servicing of a machine, intermittent use of plant during the processing might cause idle capacity, such costs are treated as an overhead expense. If the idle capacity costs have occurred due to abnormal circumstances such as lack of work or jobs, such costs would be transferred to the costing profit and loss account and hence would not be included in the factory overheads. If the idle capacity cost is due to seasonal normal factors, then the cost would be charged to units produced by inflating overhead rates.

Idle Facilities

In a firm, idle facilities may be caused due to not using the facilities provided by fixed assets (such as plant, equipment, building, space etc.) and service functions (such as personnel services, production services, material services etc.). The term idle facility is therefore broader and includes many factors causing idle facility besides including the factors responsible for idle capacity. The term 'idle facility' is considered different from 'idle capacity' in the sense that the idle capacity generally refers to under utilisation of production or plant capacity and idle capacity costs are mostly fixed in nature and cannot be absorbed or recovered due to under-utilisation of plant capacity. If a part of total facilities is not being utilised due to any reason such as lack of power, lack of demand, non-availability of raw material, fuel etc., it is known as idle facilities. Idle facilities is different from idle time and in an organisation idle time may not be found although there exists idle facilities. The treatment of cost of idle facilities is similar to that of idle capacity cost.

Set-up Time

Often, machinery and support equipment must be adjusted before a particular operation or job can be started. The time involved in getting the equipment ready for production is usually traceable to a specific operation or job and therefore, would be regarded as part of the direct cost of the job. Alternatively, setting up cost can be normally treated as a factory overhead and charged to all products, jobs, etc.

Packing Expenses

In almost all business firms manufacturing some product, expenses are incurred on packing materials which are known as packing expenses. Packing materials usually include items such as wrapping paper, bags, boxes, wood, twine, hoops, iron, cartons, glue, etc.

Packing expenses are treated in cost accounts in the following manner:

1. Prime packing materials, i.e., materials which are necessary for the product are charged to the cost of the product as an element of prime cost, e.g., paper required for wrapping in the manufacture of cigarettes.
2. Secondary packing materials are needed while delivering/transporting the products and such expenses are treated as distribution overhead.
3. Special packing material expenses if required by the customer, are charged directly to the job or product.
4. Fancy packing expenses to attract customers are selling overhead.
5. The overhead costs of the packing department should be apportioned to different products on some suitable basis such as labour cost, sale value of the product, if they cannot be charged directly to the product.

Research and Development

The cost of research specifically undertaken for a job or product may be regarded as a direct cost of that job and charged thereto. If costs on research and development are incurred for the general advantage, they may be charged to production overhead. Research directed towards the improvement of methods and current products may be treated as production overhead and should be charged to production generally. But costs incurred for the search of new products, discovery or development of new methods, products or processes are not connected with current production and should be charged directly to the profit and loss account.

Bad Debts

From past experience, the average bad debts incurred may be determined. This figure should be expressed as a percentage of the credit sales of the business and the resulting figure included in the distribution overhead.

Catalogues and Price Lists

The production of catalogues is often costly and takes place at intervals of several years. For costing purposes the expenditure incurred including the cost of staff engaged in collecting the necessary information, is charged to a suspense account and a proportion of the costs is allocated to selling and distribution every year. In such a way, the full cost of the publication is recovered from sales by the time a new edition is brought out. In financial accounts the cost of catalogues is unusually written off in the year in which it is incurred.

Tools

In most manufacturing concerns, tools are used in the manufacture of articles. Tools include drills, reamers, plugs and dies, go and no-go gauges and general cutting tools for lathes, milling machines, shapers and the like. The accounting treatment of tools is as follows:

1. Tools are treated as indirect materials if they are used for more than one product. The cost associated with such tools would be equitably apportioned among different products.
2. Sometimes tools are requisitioned and acquired for a specific job or product to ensure better quality and lowest cost for the product. When the expenditures can be measured and traced to the product which will receive the exclusive benefit from the use of tool, they are charged directly to the product. In such a case tools are treated as direct expense.
3. Tools received with machines and equipment are capitalised as capital expenditure but tools purchased subsequently are only revenue expenditures.
4. In computing the machine hour rate (for absorption of overhead) the cost of tools, depreciation, repair and maintenance are taken into account.

Patterns

Patterns are used in foundry work, where molten metal, usually cast iron, is poured into moulds. Patterns are generally permanent. Basically, there are two possibilities. First, a foundry may design its own product which may be useful to buyers. Second, the foundry (often) makes castings to a particular design of requirement of its customers. In both the cases, the cost of the patterns is treated as direct expenses like special tools.

Designs

In a company engaged in the manufacture of some complete articles, the design function includes the following functions:

1. Originating and developing new products.
2. Improving and developing the current product lines according to changes in technology and customer's habits.
3. Specifying and communicating the standards of quality.
4. Interpreting the product in the form of product specifications and/or materials and parts lists.
5. Preparing drawings and plans to define and interpret each component for manufacture.

The cost of a design may be charged totally to a specific order from a customer or alternatively, the cost of design may be apportioned over a number of years as part of research and development expenses. In this way it can be treated as a deferred revenue expenditure.

Blue Prints

A drawing office in a manufacturing company prepares drawings and blue prints with respect to products or customer's orders. Blue prints are copies of drawings prepared for immediate use. The following accounting treatments are in practice:

1. The cost of blue prints for immediate use is charged direct to the specific product or customer's order.

- The cost of drawings for specific products or jobs is charged directly to the specific products or jobs.
- The cost of drawings for standard and regular products is depreciated over the period of their life and therefore only depreciated value is considered for the year ending.

Advertising

Normal advertising in trade journals, periodicals and newspapers, by posters, radio or television and the cost of publicity literature and samples are treated as selling and distribution overhead at the time they are incurred and apportioned over the various products. Expenditure on advertising of a more permanent nature without regard to any specific product or article such as extensive campaigning required to launch a new product must be considered as a whole and apportioned in a more or less arbitrary manner. Alternatively, such advertising costs can be capitalised and written off over a short period of years in the profit and loss account. In such a case advertising depends upon policy and not upon output.

Royalties

Royalties of general nature may be treated as part of selling overhead but those paid for the use of patents or the right to market particular products are normally charged direct.

Example 7.10

Explain how to deal with the following in the cost accounts. Each answer should be in two or three sentences only, showing also the appropriate journal entry, wherever necessary:

- A shortage of 10 kg. of a store item (book value Rs. 150) was noticed during physical verification. Investigations revealed that it was due to natural causes.
- An abnormal gain of Rs 42,500 was noticed in process A of a chemical factory at the end of a month.
- A sum of Rs 15,000 was realised by sale of saw dust and useless scantlings in a furniture-making business.
- In a factory, using historical cost system, there was an under-recovery of fixed factory overheads amounting to Rs 24,000 at the end of the accounting period.
- A company spent Rs 15 lakhs on advertisement in the national television network before launching a new product.
- A sum of Rs 20,000 was incurred on printing and stationery in connection with the issue of non-convertible debentures by a company.
- A sum of Rs 7,500 was paid as wages to workers in a factory when there was no work due to power failure.
- Overtime wages amounting to Rs 500 was incurred to meet an urgent order of a customer who wanted the delivery date to be advanced. *(ICWA Inter, June 1996)*

Solution

The action to be taken is briefly explained below:

- The loss is due to natural causes, hence the loss incurred may be debited to "Factory Overhead" or "Stores Overheads" and credited to the "Stores Control Account". Simultaneously corrections may be carried out in the Bin Card and priced stores ledger.
- Abnormal Gain may be credited to costing profit and loss account and debited to process account.

- (c) The amount should be credited to "Miscellaneous Income Account". It should not affect cost of the products.
- (d) The amount under recovered as fixed overheads should be transferred by debiting the costing profit and loss account and crediting to overheads control account.
- (e) The impact of the advertisement cost on the sales for each year should be carefully estimated and only the proportionate amount of advertisement should be charged to costs each year. The balance should be treated as a deferred revenue expenditure.
- (f) This item is of pure finance and therefore should not be included in cost account.
- (g) The idle time wages, if abnormal, should be debited to costing profit and loss account direct, as an extra ordinary expense. In case the power failure is frequent and such costs are incurred often, it may be debited to idle time wages under "factory overheads" as a normal cost.
- (h) The overtime wages have to be borne by the customer, since work is rushed at his specific request. The concerned job and WIP will be directly debited by crediting the wages control account.

THEORY QUESTIONS

1. Explain the nature of administrative overheads. How are they apportioned to products?
2. Discuss the methods of absorption of selling and distribution overheads.
3. What problems are faced in applying administrative costs partly to the manufacturing and partly to the selling departments of a concern? How will you control administrative overhead of a concern?
(ICWA Inter)
4. Set out the main arguments in favour of inclusion of interest on capital in cost accounts.
(B Com, Delhi)
5. How do you deal with the following in cost accounts:
 - (a) Advertising
 - (b) Research and development cost
 - (c) Bad debts
 - (d) Rent of factory buildings
6. "Interest is a factor which cannot be disregarded by management." Comment on this statement.
(ICWA)
7. The level of production activity fluctuates widely in your company from month to month. Because of this the incidence of depreciation on unit cost varies considerably. The management decides that you find out a suitable method to correct this.
(CA Inter)
8. In a manufacturing company where costing is done with a view to fix prices, state whether and, if so, to what extent the following items are included in cost.
 - (i) Interest on borrowings
 - (ii) Bonus and gratuity
 - (iii) Depreciation on plant and machinery
(CA Inter)
9. Discuss the treatment of the following items in cost accounts:
 - (i) Capacity cost
 - (ii) Set-up time
 - (iii) Packing expenses
 - (iv) Blue print and design

PROBLEMS

1. A match factory sells its goods in four district zones—South, North, East and West. You have been given the particulars for January 2002 in respect of each zone mentioned as follows:

Zones	Net sales (in lakhs)	No. of salesmen	Average mileage covered	Advertising budget	Stock held in a time (in lakhs)	Transportation charges
South	500	30	3,000	25%	2.00	25%
North	13.50	50	4,500	30%	5.00	50%
East	3.50	20	2,700	25%	1.50	15%
West	3.00	25	2,400	20%	1.50	10%

The following are the expenses of the previous month:

Sales manager and his establishment		Rs 62,000
Travelling representatives' salaries		36,000
Travelling representatives' travelling allowance		12,000
Advertising		24,000
Godown rent at out-stations:	Rs	
South zone	7,500	
North zone	10,500	
East zone	4,800	
West zone	3,600	26,400
Insurance on inventories at out-stations		12,200
Commission on sales @ 2 1/4%		62,500
Transportation charges outward		36,000
You are required to compute selling overhead rates as a percentage of sales.		<u>2,71,100</u>

Ans: Overhead as per cent of sales

South zone 12.2%, North zone 9.6%, East zone 12.2%, West zone 12.5%

2. A manufacturing company predetermined the over-head recovery rates at 200% of the direct wages for works expenses: 10% of works costs as management expenses and 20% on cost of production towards selling and distribution expense. At the end of the month, June 2002 it found that works overheads stand under absorbed to the extent of 20% of direct wages, management expenses shown under recovery of 10% of the absorbed amount and selling and distribution expenses recovery resulted in over-absorption of 30% of the absorbed amount.

Prime cost of the jobs X, Y and Z is given below. Find the profit or loss on the respective selling prices both on the pre-determined cost basis and on the basis of full absorption of overheads:

	Job X	Job Y	Job Z
Direct materials	Rs 50.00	Rs 40.00	Rs 30.00
Direct wages	30.00	25.00	20.00
Prime cost	80.00	65.00	50.00
Selling price	200.00	160.00	120.00
Ans:	Job X	Job Y	Job Z
Profit (Predetermined cost basis)	Rs 15.20	Rs 8.20	Rs 1.20
Profit (Full absorption of overhead basis)	Rs 17.04	Rs 9.64	Rs 2.24

Part

3

Costing Methods and Accounting Systems

- Single or Output Costing
- Job, Contract and Batch Costing
- Process Costing
- Service Costing
- Cost Control Accounts
- Integrated Accounting System
- Reconciliation of Cost and Financial Accounts
- Uniform Costing and Inter-firm Comparison

Single or Output Costing

NATURE

The term “single or output costing” is applied where a single product or only a few grades of similar articles are manufactured, e.g., paper, cement, brick, coal, wine, etc. The total cost per unit is obtained by dividing the total cost of production by the number of units manufactured. The total cost of the product is determined in a cost sheet format (as discussed in Chapter 2). Since only one product is usually produced involving a single process, all costs are directly charged to that product. There is no problem of apportionment as to the products. Where several grades of the product are manufactured, it may be necessary to apportion the overhead costs relating to more than one variety of the product.

PRODUCTION STATEMENT

The production or output statement shows sales, stocks, and profit besides the cost in a statement format. The difference between a cost sheet and production statement is that a cost sheet merely records the costs incurred during the period, whereas a production statement records sales, stocks, and profit in addition to the costs incurred. Figure 8.1 gives the specimen of a production account.

OPERATION COSTING

Operation costing is a costing method which determines the unit product cost by each operation constituting the production process. It is different from process costing in the sense that each operation is considered as separate cost centre and unit product cost is determined for each operation and not for each process as in process costing. All costs of direct material, direct labour, direct expenses, are collected for each operation through direct measurement, and overhead is apportioned equitably among different operations.

Operation costing is generally used in those industries where repetitive manufacturing is done, i.e., where production includes large production runs or batches of common processes and/or materials.

Production Account			Output _____		
Particulars	Amount		Particulars	Amount	
	Rs	P		Rs	P
To direct material			By prime cost c/d		
To direct labour					
To direct expenses					

To prime cost b/d			By factory cost c/d		
To factory overheads					

To factory cost b/d			By cost of production c/d		
To office and administrative overheads					

To opening stock of finished goods			By closing stock of finished goods		
To cost of production b/d			By cost of goods sold c/d		

To cost of goods sold b/d			By sales		
To selling and distribution exp.					
To profit					

Fig. 8.1 Specimen of a Production Account

ESTIMATED COST SHEET

An estimated cost sheet is prepared before the production is commenced. These estimated costs are subsequently compared with actual costs so that costs can be controlled and be kept within prescribed limits. Besides, the estimated costs can be used by management for fixing selling prices and taking decisions regarding profit planning, production, administration and marketing. Estimation of costs is done on the basis of current situations and future circumstances like to have impact on different elements of costs. Estimated costs are always needed for submitting tenders or quotations for a specific order. The price to be quoted in a tender includes a reasonable percentage of profit. Care should be exercised while quoting price of a tender because the tender quoting the lowest price is accepted by the customer.

The treatment of stock of raw material, work-in-progress and finished goods is the same as explained in Chapter 2 while discussing preparation of Cost Sheet (Statement).

Example 8.1

A firm has purchased a plant to manufacture a new product, the cost data for which is given below:

Estimated Annual Sales	24,000 units
Estimated Costs:	
Materials	Rs 4 per unit
Direct labour	Re 0.60 per unit
Overheads	Rs 24,000 per year
Administrative expenses	Rs 28,800 per year
Selling expenses	15% of sales.

Calculate the selling price if profit per unit is Rs 1.02.

(ICWA Inter)

Solution

Computation of Selling Price per Unit

<i>Cost of Production:</i>	Rs
Material (24,000 × 4.00)	96,000
Direct Labour (24,000 × 0.60)	14,400
Overheads	24,000
Administrative Expenses	28,800
	<u>1,63,200</u>

Profit = Rs 1.02 × 24,000 = Rs 24,480

Selling expenses are 15% of sales:

Hence, Total Cost = 1,63,200 + 15% of sales

Let 'x' be total sales

$$x = \text{Total Cost} + \text{profit}$$

$$x = 1,63,200 + \left(x \times \frac{15}{100}\right) + 24,480$$

$$x - 3x/20 = 187680 = 17x = 3753600$$

or

$$x = \text{Rs } 2,20,800$$

$$\text{Selling price per unit} = \frac{2,20,800}{24,000} = \text{Rs } 9.20 \text{ per unit.}$$

Example 8.2

A company presently sells an equipment for Rs 35,000. Increase in prices of labour and material cost are anticipated to the extent of 15% and 10% respectively, in the coming year. Material cost represent 40% of cost of sales and labour cost 30% of cost of sales. The remaining relate to overheads. If the existing selling price is retained, despite the increase in labour and material prices, the company would face a 20% decrease in the existing amount of profit on the equipment.

You are required to arrive at a selling price so as to give the same percentage of profit on increased cost of sales, as before. Prepare a statement of profit/loss per unit, showing the new selling price and cost per unit in support of your answer.

(ICWA Inter, Dec. 1996)

Solution

Selling Price = Rs 35,000

Let us assume present total cost of sales as x.

Raw materials	8,726
Repairs to plant	250
Office rent and rates	650
Coal	579
Carriage inwards	391
Office salaries	940
Carriage outwards	233
General expenses	317
Factory rent and rates	2,271
Manufacturing wages and salaries	11,029
Travelling expenses	279
Sales	29,942
Stocks on 31st December, 2002	
Manufactured goods	2,794
Raw materials	200

Goods manufactured are to be debited to the sales department at current market prices, viz. Rs 2,71,50,000.

You are required to prepare accounts in such a form as to disclose; (i) Cost of raw materials consumed, (ii) Prime cost, (iii) Factory cost, (iv) Gross profit on manufacture, (v) Cost of manufactured goods, (vi) Gross profit on sales, and (vii) Net profit that may be considered rational from the accounting point of view.

(B. Com. (Hons), Delhi)

Solution

Production Account

	(Rs '000)		(Rs '000)
To Opening stock of raw materials	300	By Closing stock of raw materials	200
To Purchases of raw materials	8,726	By Cost of raw materials consumed	9,217
To Carriage inwards	391		
	<u>9,417</u>		<u>9,417</u>
To Cost of raw materials consumed	9,217	By prime cost c/d	20,246
To Manufacturing wages and salaries	11,029		
	<u>20,246</u>		<u>20,246</u>
To Prime cost b/d	20,246	By Factory cost c/d	24,646
To Factory overheads:			
Depreciation on plant	1,300		
Repairs to plant	250		
Coal	579		
Factory rent and rates	2,271		
	<u>24,646</u>		<u>24,646</u>
To Factory cost b/d	24,646	By Sales value	27,150
To Office overheads:			
Printing and stationery	93		

Office rent and rates	650		
Office salaries	940		
General expenses	<u>317</u>	<u>2,020</u>	
Cost of production		26,646	
To Gross profit on manufacture		<u>504</u>	
		<u>27,150</u>	<u>27,150</u>
To Opening stock of good manufactured		974	By Closing stock of mfd. goods
To Goods transferred from mfg. deptt.		<u>27,150</u>	By Cost of goods mfd.
		<u>28,124</u>	<u>25,330</u>
			<u>28,124</u>
To Cost of goods mfd.		25,330	By Sales
To Purchase of manufactured goods		1,274	
To Gross Profit		<u>3,338</u>	
		<u>29,942</u>	<u>29,942</u>
			<u>3,338</u>
To Selling and Distribution:			By Gross profit
Travelling expenses	279		
Discount allowed	374		
Carriage outward	<u>233</u>		
		886	
To Net Profit		<u>2,452</u>	
		<u>3,338</u>	<u>3,338</u>

General Profit and Loss Account

	(Rs '000)		(Rs '000)
To Stock reserve		By Gross profit on manufacture	504
(for unrealised profit on increase in stock of Rs 1,820)	34	By Net profit	2,452
To Net Profit	<u>2,922</u>		<u>2,956</u>
	<u>2,956</u>		

Notes: 1. It has been presumed that:

- (i) Stock of manufactured goods consist of only those goods which have been manufactured in the factory and they are at current market price.
 - (ii) Office overheads have been incurred only in respect of goods manufactured in the factory.
 - (iii) Selling overheads have been incurred both for sale of both the types of goods, i.e., those manufactured in the factory as well as those purchased from outside.
2. Stock Reserve has been calculated as follows:

$$\frac{504}{27,150} \times 1,820 = 33.78 \text{ or Rs } 34.$$

Example 8.4

A factory can produce 60,000 units per annum at its optimum (100%) capacity.
The estimated costs of production are as under:

Direct material	Rs 3 per unit
Direct labour	Rs 2 per unit
Indirect expenses:	

Fixed	Rs 1,50,000 per annum
Variable	Rs 5 per unit
Semi-variable	Rs 50,000 per annum up to 50% capacity and an extra expense of Rs 10,000 for every 25% increase in capacity or part thereof.

The factory produces only against orders (and not for own stock).

If the production programme of the factory is as indicated below and the management desires to ensure a profit of Rs 1,00,000 for the year, work out the average selling price at which each unit should be quoted:

First 3 months of the year: 50% of capacity; remaining 9 months 80% of capacity.

Ignore selling, distribution and administration overheads. (ICWA Inter, B. Com. (Hons), Delhi)

Solution

Statement of Cost

	First 3 months 7,500 units	Remaining 9 months 36,000 units	Total 43,500 units
Direct material @ Rs 3 per unit	Rs 22,500	Rs 1,08,000	Rs 1,30,500
Direct labour @ Rs 2 per unit	Rs 15,000	Rs 72,000	Rs 87,000
Prime cost	37,500	1,80,000	2,17,500
Add: Indirect expenses:			
Fixed (1:3)	37,500	1,12,500	1,50,000
Variable @ Rs 5 per unit	37,500	1,80,000	2,17,500
Semi-variable			
for first 3 months @ Rs 50,000 per annum	12,500		
For remaining 9 months @ Rs 70,000 per annum		52,500	65,000
Total Cost	1,25,000	5,25,000	6,50,000
Profit	—	—	1,00,000
Sales	—	—	7,50,000

Example 8.5

The following budgeted cost information is available from the records of a manufacturing concern:

(Rs Lakhs)

61.20

Direct Materials

Direct Wages:

Rolling shop (1,20,000 hours)

6.00

Milling shop (2,40,000 hours)

14.40

20.40

Work Overheads (Allocation on Labour Hours):

Rolling shop

9.60

Milling shop

28.80

38.40

Administrative Overheads

24.00

Selling Overheads

28.80

Distribution Overheads

14.40

The concern follows absorption method of costing. On the basis of above data, prepare a schedule of Overhead Rates. The Sales Division of the concern requires a Cost Estimate for a product for which following information are available:

- Direct Material : Material X 120 kg @ Rs 30 per kg
 Material Y 72 kg @ Rs 55 per kg
 Direct Labour : Rolling shop 40 hours @ Rs 6 per hour.
 Milling shop 70 hours @ Rs 5 per hour.

You are required to work out the Cost Estimate showing cost per unit using the above information and the overhead rates so computed. (ICWA Inter)

Solution

Schedule of Predetermined Overhead Recovery Rates for the Year

Type of overhead	Shop	Basis	Computation	Recovery rate
1. Work overhead	Rolling	Rolling Labour hrs	$\frac{\text{Budgeted overheads}}{\text{Budgeted labour hrs}}$ Rs 9,60,000 1,20,000 hrs	Rs 8 per rolling labour hr.
	Milling	Milling Labour hrs	$\frac{\text{Budgeted overheads}}{\text{Budgeted labour hours}}$ 28,80,000 2,40,000 hrs	Rs 12 per milling labour hr.
2. Administrative overheads		Percentage on works cost	$\frac{\text{Budgeted admn. overheads}}{\text{Budgeted works cost}} \times 100$ Rs 24 lakhs Rs 120 lakhs $\times 100$	20% on works cost
3. Selling Overheads		Percentage on cost of production	$\frac{\text{Budgeted Selling Cost}}{\text{Budgeted Production cost}} \times 100$ Rs 28.80 lakhs Rs 144 lakhs $\times 100$	20% on cost of production
4. Distribution		Percentage on cost of production	$\frac{\text{Rs 14.40 lakhs}}{\text{Rs 144 lakhs}} \times 100$	10% of production cost

Job Cost Estimate

<i>Elements of Cost</i>	<i>Computation</i>				<i>Amount (Rs)</i>
Direct Materials	Material X:	120 kg	@	Rs 30 =	Rs 3,600
	Y:	72 kg	@	Rs 55 =	Rs 3,960
Direct Labour	Rolling shop:	40 hrs	@	Rs 6 =	Rs 240
	Milling shop:	70 hrs	@	Rs 5 =	Rs 350
				Prime Cost	8,150.00
Works Overhead	Rolling shop:	40 hrs	@	Rs 8 =	Rs 320
	Milling shop:	70 hrs	@	Rs 12 =	Rs 840
				Works Cost	9,310.00
Admn. Overheads	20% on Works Cost (i.e., Rs 9,310)				1,862.00
				Cost of Production	11,172.00
Selling Overheads	20% on Cost of Production (i.e., Rs 11,172)				2,234.40
Distribution	10% on Cost of Production (i.e., Rs 11,172)				1,117.20
				Total Cost	14,523.60

Example 8.6

The expenses of a machine cost centre for a particular month are as follows:

- Power Rs 50,000
- Maintenance and Repairs: Rs 10,000
- Machine Operator's Wages: Rs 2,000
- Supervision: Rs 6,000
- Depreciation: Rs 40,000

Other particulars are given below:

<i>Products</i>	<i>Rate of production</i>	<i>Production in units</i>
A	30 Units per hour	1,800
B	10 Units per hour	500
C	6 Units per hour	300
D	4 Units per hour	260

The entire production was to be offered to Government on 'cost Plus 20%' basis. Material costs per units are: A: Rs 40; B: Rs 60; C: Rs 100 and D: Rs 300.

Prepare a statement showing product-wise 'cost' and 'offer price'.

(ICWA Inter)

Solution

Cost of Machine Centre

	<i>Rs</i>
Power	50,000
Maintenance and repairs	10,000
Machine operators wages	2,000
Supervision	6,000
Depreciation	40,000
	<u>1,08,000</u>

Statement Showing Product-wise Cost

Product	Output		Equivalent machine hours	Machine centre cost		Cost per unit	Material cost per unit	Total cost per unit
	Total	per hour		Per hr.	Total allocation			
A	1,800	30	60		28,800	16	40	56
B	500	10	50		24,000	48	60	108
C	300	6	50		24,000	80	100	180
D	260	4	65		31,200	120	300	420
					4.80* 1,08,000			

*1,08,000 ÷ 225 = Rs 4.80 per hour

Note : Rs 10,800 has been allocated in the ratio of machine hours (60 : 50 : 50 : 65).

Statement of 'Offer Price'

Product	Cost per unit	Profit per unit (@ 20% of cost)		Office price per unit
		Rs	Rs	Rs
A	56	11.20		67.20
B	108	21.60		129.60
C	180	36.00		216.00
D	420	84.00		504.00

Example 8.7

An article passes through three successive operations from the raw materials stage to the finished product stage. The following data are available from the production records of a particular month:

Operation No.	No. of Pcs. input	No. of Pcs. rejected	No. of Pcs. output
1	60,000	20,000	40,000
2	66,000	6,000	60,000
3	48,000	8,000	40,000

- Determine the input required to be introduced in the first operation in number of pieces in order to obtain finished output of 100 pieces after the last operation.
- Calculate the cost of raw material required to produce one piece of finished product, given the following information:

Weight of the finished piece is 0.10 kg and the price of raw material is Rs 20 per kg. (CA Inter)

Solution

(i) Statement of Production (for a Month)

Operation No.	Input, Total No.	Rejections		Output, Total No.
		Total No.	% Rejection to output	
1	60,000	20,000	50%	40,000
2	66,000	6,000	10%	60,000
3	48,000	8,000	20%	40,000

Input required for final output of 100 units:

	<i>No. of Pcs.</i>
Output of process 3	100
Loss in process No.3 20%	<u>20</u>
Input to process 3 or output of process 2	120
Loss in process 2, 10%	<u>12</u>
Input to process 2 or output of process, 1	132
Loss in process 1, 50%	<u>66</u>
Input to process 1	198

- (ii) To produce 100 piece of final output 198 pieces of initial input are used. The weight of one piece of finished output is 0.10 kg. Thus, the weight of input to produce one piece of output is 0.198 kg. The rate being Rs 20, the cost of materials for producing one piece is Rs 3.96.

THEORY QUESTIONS

1. Explain the nature of single costing.
2. Describe briefly the procedure of presenting costs under single costing. Explain giving an example.

PROBLEMS

1. M/s Indu Industries Ltd. are the manufacturers of moonlight torches. The following data relate to manufacture of torches during the month of march 2001:

Raw material consumed	Rs 20,000
Direct wages	Rs 12,000
Machine-hour worked	9,500 hours
Machine-hour rate	Rs 2
Office overheads	20% of works cost
Selling overheads	Rs 0.50 per unit
Units produced	20,000
Unit sold	18000 @ Rs 5 per unit

Prepare Cost Sheet showing the cost and the profit per unit and the total profit earned.

Ans: Prime cost Rs 32,000; Works cost Rs 51,000; Cost of production Rs 61,200; Cost of production of goods sold Rs 55,080; Cost of sales Rs 64,080; Sales 90,000, Profit Rs 25,920.

2. A manufacturer makes two kinds of electric pumps A and B. The following particulars relate to these pumps.

	<i>A</i>	<i>B</i>
Pumps manufactured	50,000	24,000
Direct cost:	Rs	Rs
Materials	6,280	5,300
Wages	18,800	11,400
Power, etc.	<u>4,200</u>	<u>2,820</u>
Total	<u>29,280</u>	<u>19,520</u>
Other costs:	Rs	
Factory supervision, etc.	7,200	
wages and expenses	800	

Management and selling expenses 8,800

You are required to prepare a statement showing the cost of each kind of pump when ready for despatch, taking the following into consideration:

- (i) Factory supervision to be charged in proportion to direct costs.
- (ii) Packing expenses to be apportioned in the ratio that direct cost plus factory supervision costs of A bear to similar costs of B.
- (iii) Management and selling expenses to be charged in proportion to the pumps manufactured.

Ans: Total cost A Rs 40,080, B Rs 25,600

3. The following details have been obtained from the cost records of Comet Paints Limited:

	Rs
Stock of raw materials on Sept. 1, 2001	75,000
Stock of raw materials on Sept. 30, 2001	91,500
Direct wages	52,500
Indirect wages	2,750
Sales	2,11,000
Work-in-progress on Sept. 1, 2001	28,000
Work-in-progress on Sept. 30, 2001	35,000
Purchases of raw materials	66,000
Factory rent, rates and power	15,000
Depreciation of plant and machinery	3,500
Expenses on purchases	1,500
Carriage outwards	2,500
Advertising	3,500
Office rent and taxes	2,500
Travellers, wages and commission	6,500
Stock of finished goods on Sept. 1, 2001	54,000
Stock of finished good on Sept. 30, 2001	31,000

Prepare a production account giving the maximum possible break-up of costs and profit.

(B. Com. (Hons), Delhi)

Ans: Prime cost Rs 1,03,500; Works cost Rs 1,17,750; Cost of production Rs 1,43,250; Cost of sales Rs 1,55,750; Profit Rs 55,250.

4. The Managing Director of a small manufacturing concern consults you as to the minimum price at which he can sell the output of one of the departments of the company which is intended for mass production in future. The company's records show the following particulars for this department for the past year:

	100 units Rs
Materials	13,000
Direct labour	7,000
Direct charges	1,000
Works overheads	7,000
Office overheads	2,800
Selling overheads	3,200
Profit	5,000
	39,000

You ascertain that 40% of the works overheads fluctuate directly with production and 70% of the selling overheads fluctuate with sales. It is anticipated that the department would produce 500 units per annum

and that direct labour charges per unit will be reduced by 20%, while fixed works overheads charges will increase by Rs 3,000. Office overheads and fixed selling overheads charges are expected to show an increase of 25% but otherwise no changes are anticipated.

Ans: Prime cost Rs 98,000; Factory cost Rs 1,19,200; Total cost 1,35,100; Profit Rs 19,868.

5. The following is the summarised Trading and Profit and Loss A/c of K. Waterproof Manufactures, Ltd., for the year ending 31st March, 2001 in which year 800 waterproofs were sold by the said company.

Trading and Profit and Loss A/c

To cost of materials	Rs 32,000	By Sales	Rs 1,60,000
To Direct wages	48,000		
To Manufacturing charges	20,000		
To Gross profit c/d	60,000		
	1,60,000		1,60,000
To office salaries	24,000	By Gross profit b/d	60,000
To Rent and taxes	4,000		
To Selling expenses	8,000		
To General expenses	12,000		
To Net profit	12,000		
	60,000		60,000

Following estimates were made by the costing department of the company for the year ending 31st March, 2002:

- (a) The output and the sales will be 1,000 waterproofs.
- (b) The price of materials will rise by 25% on the previous year's level.
- (c) Wages during the year will rise $12\frac{1}{2}\%$.
- (d) Manufacturing cost will rise in proportion to the combined cost of materials and wages.
- (e) Selling cost per unit will remain unchanged.
- (f) Other expenses will remain unaffected by the rise in output.

From the above information prepare a cost statement showing the price at which the waterproofs would be marketed so as to show a profit of 10% on the selling price.

Ans: Selling Price per waterproof Rs 218.75 including 10% profit on sales or 1/9 profit on cost.

6. Baluja Shoe Company manufactures two types of shoes A and B. Production costs for the year ended 31st December 2002 were as follows:

Direct material	Rs 15,00,000
Direct wages	8,40,000
Production overhead	3,60,000
	27,00,000

There was no work-in-progress at the beginning or at the end of the year. It is ascertained that:

- (i) The cost of direct materials in type A shoes is twice as much as that in type B.
- (ii) The direct wages for type B shoes were 60% of those of type A shoes.
- (iii) Production overhead was the same per pair of A and B type.
- (iv) Administrative overhead for each type was 150% of direct wages.
- (v) Selling cost was Rs 1.50 per pair.
- (vi) Production during the year:

Type A 40,000 pairs of which 36,000 were sold.

- Type B 1,20,000 pairs of which 1,00,000 were sold.
 (vii) Selling price was Rs 44 for type A and Rs 28 per pair for type B.
 Prepare a statement showing cost and profit.

		<i>Cost</i>	<i>Profit</i>
<i>Ans:</i>	Type A	Rs 13,50,000	Rs 2,34,000
	Type B	Rs 22,50,000	Rs 5,50,000

Hint: 1. Direct material cost has been calculated as follows: Assume direct material cost per pair for type B is X.

Therefore, direct materials cost per pair of type A will be 2X.

Total direct material cost for type B would be 1,20,000X.

Total direct material cost for type A would be 80,000X.

Thus, $1,20,000X + 80,000X = 15,00,000$

or $2,00,000X = \text{Rs } 15,00,000$

or $X = \text{Rs } 7.50 \text{ per pair}$

Thus, cost of direct material for type B is Rs 7.50 per pair and type A Rs 15 per pair.

2. Direct labour cost has been calculated as follows:

Suppose X is the direct labour cost per pair for type A

Thus, for type B shoes, direct labour cost per pair will be $.6X(X \times 60/100)$

Total cost will be $40,000X + 72,000X = 8,40,000$

or $X = \frac{8,40,000}{1,12,000} = \text{Rs } 7.50 \text{ per pair}$

Direct labour cost is Rs 7.50 per pair for type A and 4.50 per pair for type B.

3. Production overhead per pair will be $\frac{\text{Rs } 3,60,000}{1,60,000} = \text{Rs } 2.25$

Job, Contract and Batch Costing

NATURE OF JOB COSTING

Job costing is a costing method applied to determine the cost of specific jobs or lots of production generally manufactured according to customers' specifications. The main feature of the job order costing system is that no two orders are necessarily alike and all orders do not pass through the same manufacturing process. Generally, the job order system is used by manufacturing concerns where an order is produced to a customer's specifications, such as building, contracting, machine tool manufacturing, furniture, foundries, job printing and general engineering. A job may be a product, unit, batch, sales order, project, contract, service, specific programme or any other cost objective that is clearly distinguishable and unique in terms of materials and other services used.

Advantages

Job costing has the following advantages:

1. More accurate costing is possible because all costs are compiled and specifically identified with a specific order or product.
2. It is simple as the recording of direct materials, and direct labour hours is done by product or job.
3. Job cost sheets can be used to control efficiency and estimate future work.
4. It provides a basis for comparing one job cost to another or for comparing a job cost sheet to a cost estimate.

Disadvantages

Job costing has the following disadvantages:

1. It requires detailed record-keeping for different jobs.
2. The record-keeping for different jobs may prove complicated.
3. A job may be charged for inefficiencies (downtime) although it has not caused it.

JOB COST SHEET AND JOB LEDGER

The focal point of a job order cost system is the cost sheet on which charges for direct materials, direct labour, and indirect manufacturing costs can be accumulated as work on a job order progresses. It is in

summary form and records the job number and other specifications and descriptive information as given in the production order. The design of the cost sheet and the number of columns to be used must be determined in terms of departmental and manufacturing characteristics of the business operations. Basically, the recorded costs are grouped under three major headings: material costs, labour costs and applied manufacturing overhead costs. Figure 9.1 presents a specimen of a job cost sheet. When a production order is started in process, a cost sheet identified by a job number is set up in the accounting department.

ABC Company				
Job Order Cost Sheet				
Customer Name _____	Date _____	Job Order No. _____		
	Product description _____			
	Selling price _____	Total cost _____		
	Cost per unit _____			
	Department 1	Department 2	Department 3	
Materials:				
	Date(s) _____			
	Requisition no. _____			
	Amount _____			
Labour:				
	Date(s) _____			
	Job time card no. _____			
	Amount _____			
Overhead:				
	Rate/Basis _____			
	Amount absorbed _____			
Cost summary:	Deptt. 1	Deptt. 2	Deptt. 3	Total
Material	_____	_____	_____	_____
Labour	_____	_____	_____	_____
Overhead	_____	_____	_____	_____
Total	_____	_____	_____	_____
Units completed _____	Date Completed _____			

Fig. 9.1 Specimen of a Job Sheet

When the job order is finished/completed, the cost summary at the bottom of the form is completed and a unit cost for the job order is computed.

RECORDING COSTS ON JOBS

Materials Costs

Materials used in manufacturing and/or completing jobs are known as direct materials which become part of the finished product. Direct materials are directly charged to the job on which they are used and

indirect materials or factory supplies are part of manufacturing overhead and are allocated to the various jobs.

Labour Costs

Direct labour costs can be identified with specific jobs with the help of "job time tickets". When a worker begins work on an order, the starting time is noted on the ticket; when the job order is finished, the stopping time is written in and the time spent on a job is noted. Earnings (wages) are then computed using the employee's hourly rate.

Direct Expenses

Generally speaking, direct expenses are directly charged to individual jobs for which they are incurred. The invoices (of direct expenses) as documentary evidence can be marked with the number of the job to which the cost is to be allocated.

Overhead

Overhead costs are usually charged to work-in-progress by means of a predetermined absorption rate calculated in advance of production. This is derived on the basis of budgeted figures.

RECORDING COMPLETED JOBS

When a job is finished, its cost is determined by totalling prime costs and absorbed overhead. The cost sheet is then marked "completed" and removed from the job ledger. An entry is made to the proper account in the finished goods ledger.

When no unit on a job order is completed, the total cost incurred on the job order so far becomes work-in-progress. Under job costing, the value of closing work-in-progress is obtained from the work-in-progress account. The work-in-progress at the end of an accounting period is carried forward to the subsequent accounting period as opening stock. The expenditure incurred on the job in this subsequent period is added to the opening stock.

Example 9.1

The following information for the year ended 31st December, 2000 is obtained from the books and records of a factory:

	<i>Completed Jobs Rs</i>	<i>W.I.P. Rs</i>
Raw material supplied from stores	88,000	32,000
Wages	1,00,000	40,000
Chargeable expenses	10,000	4,000
Materials returned to stores	1,000	-

Factory overheads are 80% of wages. Office overheads are 25% of factory cost and selling distribution overheads are 10% of cost of production.

The complete jobs realised Rs. 4,10,000. Write up:

- (i) Work-in-progress Ledger Control Account
- (ii) Completed Job Ledger Control Account; and
- (iii) Cost of Sales Account

(B. Com. (Hons), Delhi, 2001)

(b) Solution:

Consolidated Work-in-Progress A/c

Dr.	Rs	Cr.
	Rs	Rs
To raw Material consumed	32,000	
To Wages	40,000	
To Chargeable Expenses	4,000	
To Factory Overheads (80% of wages)	32,000	
Factory Cost	1,08,000	
To Administrative overheads (25% of Rs 1,08,000)	27,000	
	1,35,000	1,35,000

Note: Selling and distribution overhead has not been charged in Work- in-progress A/c.

Consolidated Completed Job A/c

Dr.	Rs.	Cr.
	Rs.	Rs.
To Raw Material Consumed 88,000	87,000	By Customer's A/c (Amt. of Jobs completed & Realised)
Less: Returned to store (-) 1,000		
To Wages	1,00,000	4,10,000
To Chargeable Expense	10,000	
To Factory Over heads (80% of Rs 1,00,00 of wages)	80,000	
Factory Cost	2,77,000	
To Admn. Overheads (25% of Rs. 2,77,000)	69,250	
Cost of Production	3,46,250	
To Selling and Distribution Overhead	34,625	
To N.P. transferred to P and L A/c	29,125	
	4,10,000	

Cost of Sales Account

Dr.	Rs	Cr.	Rs
To Material concerned	87,000	By Balance c/d	3,80,875
To Wages	1,00,000		
To Direct Charges	10,000		
To Factory Overhead (80% of wages)	80,000		
Factory Cost	2,77,000		
To Admn. Overheads (25% of Rs 2,77,000)	69,250		
	3,46,250		
To Selling and Distribution 10% of Rs 3,46,250	34,652		
Cost of Sales	3,80,875		3,80,875

Example 9.2

Xavier company manufactures many products. Each product passes through two production departments, which have the following cost structures:

	<i>Department A</i>	<i>Department B</i>
Normal monthly volume (based for overhead rate)	5,000 direct labour hours	10,000 pounds of materials
Monthly fixed costs at normal volume	Rs 10,000	Rs 40,000
Monthly variable costs at normal volume	15,000	20,000

Two job orders that went through the factory last month had the following results:

	<i>Job 1 (Product X)</i>		<i>Job 2 (Product Y)</i>	
	<i>Quantity</i>	<i>Cost (Rs)</i>	<i>Quantity</i>	<i>Cost (Rs)</i>
Direct inputs:				
Direct materials	480 lbs	2,400	1,500 lbs	4,800
Direct labour:				
Department A	180 hrs	1,620	100 hrs	900
Department B	60 hrs	420	40 hrs	280
Output	600 units		1,000 units	

- Calculate the unit cost of each of these jobs on a full costing basis.
- Recalculate unit costs on a variable costing basis.
- Why are the relative variable costs of these two products so different from their relative full costs?

Solution

- (a) Full-costing overhead rates:

Department A: Rs 25,000/5,000 = Rs 5 a direct labour-hour

Department B: Rs 60,000/10,000 = Rs 6 a pound

Job order costs:	<i>Job 1</i>	<i>Job 2</i>
	Rs 2,400	Rs 4,800
Direct materials		
Direct labour		
Department A	1,620	900
Department B	420	280
Overhead: Department A at Rs 5	900	500
Department B at Rs 6	2,880	9,000
Total	<u>Rs 8,220</u>	<u>Rs 15,480</u>
Unit cost Job 1, Rs 8220/600 units,	Rs 13.70	Rs 15.48
Job 2, Rs 15480/1000 units		

(b) Variable costing overhead rates:

Department A: Rs 15,000/5,000 = Rs 3 a direct labour-hour

Department B: Rs 20,000/10,000 = Rs 2 a pound

Job order costs:	<i>Job 1</i>	<i>Job 2</i>
	Rs 2,400	Rs 4,800
Direct materials		
Direct labour:		
Department A	1,620	900
Department B	420	280
Overhead:		
Department A at Rs 3	540	300
Department B at Rs 2	960	3,000
Total	<u>Rs 5,940</u>	<u>Rs 9,280</u>
Unit cost	Rs 9.90	Rs 9.28

(c) Variable unit cost of job 2 is less than that of job 1; full cost was greater for job 2 than for job 1. The main reason is that job 2 used much more of department B's capacity than job 1, and department B has a much higher proportion of fixed costs than department A. Total profit is thus much more sensitive to variations in sales of product Y (job 2) than to variations in sales of product X.

Example 9.3

As newly appointed chief cost clerk you find that the selling price of Job No. 1234 has been calculated on the following basis:

Materials	Rs 120.80
Direct wages: 22 hours at Rs 2.50 per hr	Rs 55.00
Deptt. A: 10 hr	<u>175.80</u>
Deptt. B: 4 hr	
Deptt. C: 8 hr	

Plus $33\frac{1}{3}\%$ on prime cost

58.60

 Rs 234.40

An analysis of the previous year's profit and loss account shows the following:

Profit and Loss A/c

	Rs 7,75,000	Sales Rs 13,50,000
Materials Used		
Direct Wages		
Deptt. A:	50,000	
Deptt. B:	60,000	
Deptt. C:	40,000	
	1,50,000	
Factory Overhead		
Deptt. A:	25,000	
Deptt. B:	40,000	
Deptt. C:	10,000	
	75,000	
Gross profit c/d	3,50,000	
	Rs 13,50,000	13,50,000
Selling costs	3,00,000	Gross profit Rs 3,50,000
	50,000	
No profit	3,50,000	3,50,000

You are required to:

- (a) draw up a job cost sheet;
- (b) calculate and enter the revised costs using the previous year's figures as a basis;
- (c) add to the total job cost 10% for profit and give the final selling price.

Solution

Job Cost Sheet: Job No. 1234

Direct material	Rs 120.80
Add: Direct wages	55.00
	175.80
Prime cost	
Add: Factory overhead:	
Deptt. A 50% of Rs 25 = 12.50	
Deptt. B $66\frac{2}{3}\%$ of Rs 10 = 6.67	
Deptt. C 25% of Rs 20 = 5.00	
	24.17
Factory cost	199.97

Add: Selling costs		59.99
	Total cost	<u>259.96</u>
Profit 10%		25.99
		<u>Rs 285.95</u>

Calculations:

Factory overhead can be calculated as a rate per direct labour hour or as a percentage of wages. A percentage of wages has been taken to recalculate the cost sheet.

$$\text{Deptt. A } 25,000/50,000 \times 100 = 50\%$$

$$\text{Deptt. B } 40,000/60,000 \times 100 = 66\frac{2}{3}\%$$

$$\text{Deptt. C } 10,000/40,000 \times 100 = 25\%$$

Selling costs are expressed as a percentage of the cost of sales, i.e.

$$(300,000/10,00,000) \times 100 = 30\%$$

CONTRACT COSTING

Contract costing, sometimes known as terminal costing, follows the same principles as job costing and is used by such concerns as firms of builders and public works contractors who undertake work on a contract basis.

Following are the special features of contract costing:

1. The contractor begins work on a small number of large contracts in the course of a year.
2. The contracts are completed away from the contractor's premises.
3. The contracts may continue over more than one accounting period.
4. Materials are purchased and delivered direct to the contract site and/or are drawn from the central stores.
5. The payroll is prepared at either the site or at a central administrative office.
6. Sub-contractors may be employed, e.g. ventilation engineers, lift manufacturers, flooring specialists, etc.
7. Plant and equipment may be purchased, or hired for the duration of the contract from another business or from a central plant department.
8. Payment by the customer for various stages of the contract is made only on receipt of architect's certificate for the completed stage. A reduction called retention money is withheld by the customer until a specific period of time, agreed in the original contract, has passed.
9. The contract price is normally estimated in advance of the work. Additional work found necessary may be charged on a cost-plus basis. In addition, clauses may be inserted to allow the contractor to pass on to the customer additional costs incurred as a result of increase in material, labour and other costs.

RECORDING COSTS ON CONTRACT

Under contract costing, a contract is basically the cost unit and for the purpose of control, it can be regarded as a cost centre. Under contract costing only allocation is required directly to the contract.

Overhead costs are normally incurred at the head office and are sometimes known only as storage costs. Such overhead costs tend to be of a small figure and are often absorbed on some arbitrary basis such as a percentage on prime cost.

A separate account, the contract account, is opened for each individual contract for the purpose of determining the profit or loss on each contract. In the contract account the following costs are recorded:

Materials

Materials required for a specific contract are debited to the contract account. Materials returned under the materials returned note are credited with the contract.

Materials transferred from one contract to another are recorded in material transfer notes; the contract receiving the material is debited and the contract giving the material is credited. Materials not required for current use are sometimes sold at the site, and the amount received from sale of materials is credited to the contract account, and any profit or loss, being the difference between the cost and sale value, is transferred to the profit and loss account. This also applies not only to materials, but also to sale of plant, machinery, tools, etc. At the end of the accounting period the value of materials remaining unutilised on site is carried forward as a charge against the next period. In the accounting year, the amount will be debited to the materials or stores at site account and credited to the contract account. Materials stolen or destroyed by fire are transferred to the profit and loss account and also shown on the credit side of the contract account.

The customer or contractee may supply certain materials from own stock to be utilised in construction work. Such materials should not be debited (charged) to the contract account; a separate memorandum record outside the account will be sufficient. Such materials do not affect the contract price.

Wages

Wages of all workers engaged on a particular contract are allocated direct to that contract, regardless of work they perform. Where workers move from one contract to another, time-sheets must be maintained and wages may be distributed on the basis of time spent under each contract. The wages of the head office and central stores are considered as overhead and are charged to contracts on an equitable basis. Wages accrued or outstanding at the end of the period should appear on the debit side of contract.

Expenses

All expenses other than material and wages are charged to individual contracts as and when they are incurred. Examples of such expenses are hire charge of plants obtained from outside, architects' and consultants' fees, electricity, insurance, etc.

Plant and Machinery

For use of plant and machinery in a particular contract, the depreciation may be charged in any one of the following ways:

1. When the plant has been specially purchased for a particular contract and will be exhausted at site, the total cost of the plant is debited to the contract in which it is used. When the contract is completed or the plant is no longer required, it may be sold at site and contract is credited with the sale proceeds. If it is not sold, the contract is credited with the depreciated (revalued amount)

value. Thus, the contract account stands debited with the amount of depreciation. This method has the drawback that the debit side is unnecessarily inflated with the plant value, and the cost of contract at first sight appears to be very high. In order to overcome this problem, the difference between the original cost at commencement and the depreciated value at the end of the period is obtained and charged to the contract account concerned as plant depreciation.

- When the plant is sent to the contract site only for a short period, it is usual to charge the contract for the use on a daily or hourly basis. Depreciation is charged at an hourly rate for the hours the plant has worked. If the plant is taken on hire, only the hire charges are debited to the contract and not depreciation.

Sub-Contract

When a sub-contractor is engaged for a special work connected with the main contract, the work performed by the sub-contractor forms a direct charge to the main contract. The payments made to sub-contractors are charged in totals to the concerned contract account as direct expense and no detailed record, or break-up of the sub-contract amount is necessary for cost purposes.

Materials issued to the sub-contractor, free of charge, should be charged to the contract account. Heavy tools and equipment may be supplied to sub-contractor on a rental basis. The depreciation on these equipments should be charged to the contract account and the rental received is credited to it or shown as a deduction from the sub-contractor's bill.

VALUE AND PROFIT OF CONTRACT

As the contract work proceeds, the surveyor appointed by the contractee issues certificates to the effect that so much portion has been completed. The contractor will get money according to this certificate and a certain portion thereof shall be retained by the contractee. The money so retained is called retention money. For example, if a certificate has been issued for Rs 2,00,000 and 70% has been paid, the following entries will be made:

First Method

1. Contractee's account	2,00,000	
To contract A/c		2,00,000
(being value of the work certified)		
2. Bank A/c Dr	1,40,000	
To contractee's A/c		1,40,000
(being amount of cash received)		

Second Method

The amount of work certified will be debited to the work-in-progress account and credited to the contract account. The work-in-progress account is shown as an asset in the balance sheet after deducting the amount received from the contractee. Until the contract is completed, the amount received from the contractee is advance payment and is deducted from work-in-progress in the balance sheet. When the

contract is completed, the contractee account is debited with the contract price. In the next year, the work-in-progress account is transferred to the debit side of the contract account. On completion of the contract, the contractee's personal account is debited and the contract account credited. Taking the above example, the journal entries will be as follows:

- | | | |
|--------------------------------|-------------|-------------|
| 1. Work-in-progress A/c | Rs 2,00,000 | |
| To Contract A/c | | Rs 2,00,000 |
| <i>(being amount received)</i> | | |
| 2. Bank A/c Dr | Rs 1,40,000 | |
| To Contractee's A/c | | 1,40,000 |
| <i>(being amount received)</i> | | |

<i>Balance Sheet</i>		
Asset Side		
Work-in-progress	(Rs) 2,00,000	
Less: Amount received	<u>1,40,000</u>	60,000

Such work which has not been so far approved by the contractee's architect or surveyor is termed as "work uncertified". It is valued at cost and credited to the contract account and debited to the work-in-progress account, which will be transferred in the next year to the debit side of the contract account.

Work certified and work uncertified can be found in the following manner:

<i>Cost of Work Certified:</i>	<i>Cost of Work Uncertified:</i>
Cost of work to date	Total cost to date
Less: Cost of work uncertified	Less: Cost of work certified
Materials on hand	Materials in hand
Plant at site	Plant at site
Cost of work certified	Cost of work uncertified

WORK-IN-PROGRESS

Work-in-progress includes the amount of work certified (valued at contract price) and the amount of work uncertified. The work-in-progress account will appear on the asset side of the balance sheet. The amount of cash received from the contractee and reserve for contingencies (as discussed in the case of incomplete contracts) will be deducted out of this amount. The work-in-progress account appears as follows in the balance sheet.

- When work certified has been treated according to the first method:

Balance sheet as on _____

Work-in-progress:
 Balance in the contractee's A/c
Add: Work uncertified
Less: Reserve for unrealised profit

- When work certified has been treated according to the second method:

Balance sheet as on _____

Work-in-progress:
 Value of work certified _____

Cost of work uncertified	_____
Less: Reserve for unrealised profit	_____
Less: Amount received from contractee	_____

In contract accounts the value of work-in-progress consists of: (i) the cost of work completed, both certified and uncertified, (ii) the cost of work not yet complete; and (ii) the amount of profit taken as credit. Taking these into account, the work-in-progress in the balance sheet can be shown as follows:

Balance sheet as on _____

Work-in-progress:	
Cost of work certified	_____
Cost of work uncertified	_____
Less: Amount received from contractee	_____
Add: Profit taken as credit to profit and loss A/c	_____

PROFIT ON INCOMPLETE CONTRACTS

Many contracts take more than one financial accounting year to be completed. A problem arises whether profit on such a contract should be worked out only on its completion or whether some profits may be computed every year. The conservative method, is to value work-in-progress only at cost and no credit is taken for profit till it is actually earned. This method, however, results in wide fluctuations in the net profit of the enterprise from year to year. If several contracts are completed in a year, the profit will be high while in extreme cases in some years, when not a single contract is fully completed, the profit will be nil. It becomes necessary, therefore, to compute profit on partly completed contracts and take credit for a part of it in the accounts at the year end.

The manner of computation of profit is largely dependent upon how far the contract has advanced, i.e., the stage of completion it has reached.

1. Profit should be considered in respect of work certified only, work uncertified should always be valued at cost.
2. For contracts which have been completed less than one-fourth of the contract, no profit should be computed and credited to the profit and loss account.
3. In case of contracts which are complete by more than 25% but less than 50%, one-third of notional profit, reduced in the ratio of cash received to work-certified, is transferred to profit and loss A/c. The balance in the notional profit is carried forward in the same contract as profit in suspense as a provision against future losses, increase in costs and other contingencies. The following formula is used to determine the amount of profit to be transferred to profit and loss A/c.

$$\frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

Notional profit is the difference between the value of work certified and cost of work certified. It is determined in the following manner.

$$\text{Notional profit} = \text{Value of work certified} - (\text{cost of work to date} - \text{cost of work not yet certified})$$

4. In case contracts are complete between 50% and 90% (more than 50% but less than 90%, two-third of notional profit, reduced by the proportion of cash received to work certified, is transferred to profit and loss A/c. The formula to be used for this purpose is:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

5. In case contracts are complete by 90% or more than 90%, the contract is considered almost complete. In such contracts, the estimated total profit is first determined by deducting the total costs to date and additional expenditure necessary to complete the contract from the contract price. A portion of this estimated total profit is credited to profit and loss A/c, which can be determined by using any one of the following formulae:

$$(i) \text{ Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

$$(ii) \text{ Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

or

$$\text{Estimated Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

The second formula is preferable to first formula. In case estimated profit cannot be determined due to some reason, e.g. if additional expenditure is not mentioned, then the amount of profit to be transferred to profit and loss A/c is determined using the following formula:

$$\text{Notional Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

6. The total of loss, if any, should be transferred to the profit and loss account by crediting the contract account.

In contract accounting, the profit earned on contracts is reduced proportionately by the amount of cash received, otherwise the unrealised profit may stand for distribution as dividends. Also, the sound principle of conservatism requires that all future contingencies and possible losses should be accounted for before determining the profit on contract.

COST-PLUS CONTRACT

A cost-plus contract is a contract in which the value of the contract is determined by adding a fixed margin of profit to the total cost of the contract. The contractee agrees to pay this inflated value of contract which includes a profit margin as per the agreement. Both the parties determine in advance the possible costs that would be included in the cost of contract. The profit to be added to the cost of contract may be agreed as a percentage on cost or the capital employed. Cost-plus contracts are generally needed when the costs of contracts cannot be accurately determined due to unstable and fluctuating conditions of materials, labour and service, etc. The price of materials, labour and services usually tend to fluctuate over a long period.

Cost-plus contracts are useful to both the parties, contractor (manufacturer), contractee (customer). The contractor is suitably protected against any fluctuations in the prices of materials, labour, and overhead which will be used in production or completion of the job. A cost-plus contract is beneficial to the contractee (customer) also. The contractee is protected against an uncertain market which may push up the cost of the contract. The price agreed to be paid by the contractee is based on actual cost. In this way the contract price is not determined arbitrarily.

Sometimes a contract may contain an “escalator clause” which provides for change in the price of the contract due to change in the prices of the raw materials, labour and overhead services. The contractor presents evidential proof of increased costs to the contractee to claim reimbursements. Under the escalator clause the contract price is increased for a given increase in the prices of inputs. For instance, it may be agreed that if the prices of raw materials go up by 15%, the contract price will be increased by 2%.

Example 9.4

Compute a conservative estimate of profit on a contract (which is 80% complete) from the following particulars. Illustrate at least four methods of computing the profit:

	Rs
(i) Total expenditure to date	1,02,000
(ii) Estimated further expenditure to complete the contract (including contingencies)	20,400
(iii) Contract price	1,83,600
(iv) Work certified	1,20,000
(v) Work uncertified	10,200
(vi) Cash received	97,920

(B. Com. (Hons), Delhi 1997)

Solution

Profit on incomplete contracts may be calculated according to any of the following four methods:

	Rs
Total Contract Price	1,83,600
Less Expenditure to date	1,02,000
Estimated further expenditure	20,400
Estimated profit	61,200

Profit to be taken to P&L Account:

Ist Method

$$\frac{61,200}{1,83,600} \times 1,20,000 = \text{Rs } 40,000$$

IInd Method

$$\text{Estimated profit} \times \frac{\text{Work Certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Work Certified}}$$

$$61,200 \times \frac{120,000}{1,83,600} \times \frac{97,920}{1,20,000} = \text{Rs } 32,640$$

IIIrd Method

$$\text{Estimated profit} \times \frac{\text{Cost of Work to date}}{\text{Estimated total Cost}}$$

$$61,200 \times \frac{1,02,000}{1,22,400} = \text{Rs } 51,000$$

With Method

$$\text{Estimated profit} \times \frac{\text{Cost of Work to date}}{\text{Estimated total Cost}} \times \frac{\text{Cash received}}{\text{Work Certified}}$$

$$61,200 \times \frac{102,000}{1,22,400} \times \frac{97,920}{1,20,000} = \text{Rs } 41,616$$

Alternatively, notional profit can be used to determine amount to be transferred to P & L a/c.

$$\begin{aligned} \text{Notional profit} &= \text{Work Certified} + \text{Work uncertified} - \text{Total expenditure} \\ &= \text{Rs } 1,20,000 + 10,200 - 1,02,000 \\ &= \text{Rs } 28,200 \end{aligned}$$

Since more than half the work is complete, the profit to be taken to P/L Account may be reduced to 2/3 as shown below:

$$\text{Rs } 28,200 \times 2/3 = \text{Rs } 18,800$$

The profit calculated as above (Rs 18,800) may further be reduced on cash basis:

$$\text{Rs } 18,800 \times \frac{97,920}{1,20,000} = \text{Rs } 15,340$$

Example 9.5

An expenditure of Rs 1,94,000 has been incurred on a contract to the end of 31st March, 2000. The value of work certified is Rs 2,20,000. The cost of work done but not yet certified is Rs 6,000. It is estimated that the contract will be completed by 30th June, 2000 and an additional expenditure of Rs 40,000 will have to be incurred to complete the contract. The total estimated expenditure on the contract is to include a provision of 2 1/2% for contingencies. The contract price is Rs 2,80,000 and Rs 2,00,000 has been realised in cash upto 31st March, 2000.

Calculate the proportion of Profit to be taken to the Profit and Loss Account as on 31st March, 2000 under different methods.

(B. Com. (Hons), Delhi 2000)

Ans.

(i) Total Profit	Rs
Total Expenditure upto 31st March, 2000	1,94,000
Less Cost of work uncertified	6,000
Cost of work certified	1,88,000
Value of work certified	2,20,000
Total Profit =	32,000
(ii) Estimated Profit:	Rs
Expenditure upto 31.3.2000	1,94,000
Estimated additional expenditure	40,000
	2,34,000
Add 2 1/2% of contingencies.	5,850
	2,39,850

Estimated Total Cost	2,39,850
Contract Price	2,80,000
Estimated Profit =	40,150

(iii) Profit taken to the credit of P & L A/c

$$(a) \text{ Estimated Profit} \times \frac{\text{Certified Work}}{\text{Contract Price}}$$

$$= 40150 \times \frac{2,20,000}{2,80,000} = \text{Rs } 31,546.42$$

(b) By Applying conservative method:

$$\text{Estimated Profit} \times \frac{\text{Cash Received}}{\text{Contract Price}}$$

$$40150 \times \frac{2,00,000}{2,80,000} = \text{Rs } 28678.57$$

Example 9.6

Paramount Engineers are engaged in construction and erection of a bridge under a long-term contract. The cost incurred upto 31.03.2001 was as under:

<i>Fabrication</i>	<i>Rs in Lakhs</i>
Direct Materials	280
Direct Labour	100
Overheads	60
	440
Erection costs to date	110
	550

The contract price is Rs 11 crores and the cash received on account till 31.03.2001 was Rs 6 crores.

A technical estimate of the contract indicates the following degree of completion of work:

Fabrication—Direct Material—70%, Direct Labour and Overheads 60%, Erection—40%. You are required to estimate the profit that could be taken to Profit and Loss Account against this partly completed contract as at 31.03.2001.

(CA Inter, May 2001)

Solution

Estimation of Profit to be taken to Profit and loss Account against partly completed contract as at 31.3.2001

$$\text{Profit to be taken to P/L Account} = \frac{2}{3} \times \text{Notional profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(Refer to working notes 1, 2, 3 & 4)

$$= \frac{2}{3} \times \text{Rs } 92.48 \text{ lakhs} \times \frac{\text{Rs } 600 \text{ lakhs}}{\text{Rs } 642.48 \text{ lakhs}}$$

$$= \text{Rs } 57.576 \text{ lakhs}$$

Working Notes:

1. Statement showing estimated profit to date and future profit on the completion of contract

(Rs in lakhs)

Particulars	Cost to date		Further costs		Total cost Rs (a) + (b)
	% completion to date	Amount Rs (a)	% completion to be done	Amount Rs (b)	
<i>Fabrication costs:</i>					
Direct material	70	280.00	30	120.00	400.00
Direct labour	60	100.00	40	66.67	166.67
Overheads	60	60.00	40	40.00	100.00
Total fabrication costs: (A)		440.00		226.67	666.67
<i>Erection cost: (B)</i>	40	110.00	60	165.00	275.00
Total estimated costs: (A + B)		550.00		391.67	941.67
Profit		92.48		65.85	158.33
<i>(Refer to working note 2)</i>		642.48		457.52	1,100.00

2. Profit to date (Notional Profit) and future profit are calculated as below:

$$\begin{aligned} \text{Profit to date (Notional Profit)} &= \frac{\text{Estimated profit on whole contract} \times \text{Cost to date}}{\text{Total Cost}} \\ &= \frac{\text{Rs } 158.33 \times \text{Rs } 550}{\text{Rs } 941.67} \\ &= \text{Rs } 92.48 \text{ (lakhs)} \\ \text{Future profit} &= \text{Rs } 158.33 - \text{Rs } 92.48 \\ &= \text{Rs } 65.85 \end{aligned}$$

3. Working certified:

$$\begin{aligned} &= \text{Cost of the contract to date} + \text{Profit to date} \\ &= \text{Rs } 550 + \text{Rs } 92.48 = \text{Rs } 642.48 \text{ lakhs} \end{aligned}$$

4. Degree of Completion of Contract to date:

$$\begin{aligned} &= \frac{\text{Cost of the contract to date}}{\text{Contract price}} \times 100 \\ &= \frac{\text{Rs } 642.48 \text{ lakhs}}{\text{Rs } 1,100 \text{ lakhs}} \times 100 \\ &= 58.40\% \end{aligned}$$

Example 9.7

M/s New Century Builders have entered into a contract to build an office building complex for Rs 480 lakhs. The work started in April 1997 and it is estimated that the contract will take 15 months to be completed. Work has progressed as per schedule and the actual costs charged till March 1998 are as follows:

	<i>(Rs in lakhs)</i>
Materials	112.20
Labour	162.00
Hire Charges for equipments and other expenses	36.00
Establishment Charges	32.40
	342.60

The following information are available:

	<i>(Rs in lakhs)</i>
Materials in hand (March 31, 1998)	6.60
Work certified (of which Rs 324 lakhs have been paid) at March 31, 1998	400.00
Work not yet certified at March 31, 1998, at cost	7.50

As per management estimates, the following further expenditure will be incurred to complete the work:

	<i>Rs (in lakhs)</i>
Materials	10.50
Labour	16.00
Sub-contractor	20.00
Equipments hire and other charges	3.00
Establishment charges	6.90

You are required to compute the value of work-in-progress as on March 31, 1998 after considering a reasonable margin of profit and show the appropriate accounts. Make a provision for contingencies amounting to 5% of total costs. *(ICWA Inter, Dec. 1998)*

Solution:

Contract Account

<i>Particulars</i>	<i>Rs</i>	<i>Particulars</i>	<i>Rs</i>
To Materials	1,12,20,000	By Stock of Materials	6,60,000
To Labour	1,62,00,000	By Work-in Progress:	
To Hire Charges	36,00,000	work certified	4,00,00,000
To Establishment Charges	32,40,000	Work uncertified	7,50,000
To Profit c/d	71,50,000		
	4,14,10,000		4,14,10,000
To Profit & Loss A/c (WN 1)	50,00,000	By Profit b/d	71,50,000
To Balance (being Reserve)	21,50,000		
	71,50,000		71,50,000

Contractee's Account

Particulars	Rs	Particulars	Rs
To Contract A/c	4,00,00,000	By Bank	3,24,00,000
		By Balance c/d	76,00,000
	<u>4,00,00,000</u>		<u>4,00,00,000</u>

Working Notes:

1. Profit to be taken to P&L

The profit to be taken to P&L Account on the contract for the year ending 31st March, 1998 has been arrived at as follows:-

Expenditure upto March 31, 1998 (Rs 3,42,60,000 – 6,60,000) = Rs 3,36,00,000

Add: Estimated Expenditure to Complete:

Materials	10,50,000	
Add: Stock as on March 31, 1998	<u>6,60,000</u>	17,10,000
Labour		16,00,000
Sub Contractors		20,00,000
Hire charges on Equipment etc.		3,00,000
Establishment Charges		<u>6,90,000</u>

63,00,000

Provision for Contingencies

21,00,000

(@ 5% on total cost (3,99,00,000 × 5/95)

Total Estimated Cost 4,20,00,000

Total Estimated Profit 60,00,000

Contract Price 4,80,00,000

$$\text{Profit to be taken to P\&L} = \text{Total Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

$$= \text{Rs } 60,00,000 \times \frac{\text{Rs } 4,00,00,000}{\text{Rs } 4,80,00,000} = \text{Rs } 50,00,000^*$$

*The amount of profit may further be reduced to cash basis, if desired.

2. Computation of value of work-in-progress

Value of Work Certified	4,00,00,000
Add: Cost of Work Uncertified	<u>7,50,000</u>
	4,07,50,000
Less: Reserve being Profit not taken to P&L as on 31.3.1998	<u>21,50,000</u>
	3,86,00,000
Less: Cash received	<u>3,24,00,000</u>
Balance of Work-in-progress to be shown in Balance Sheet	<u>62,00,000</u>

Example 9.8

One of the building contracts currently engaged in by a construction company commenced 15 months ago and remain unfinished. The following information relating to the work on the contract has been prepared for the year just ended:

<i>Particulars</i>	<i>Rs '000</i>
Contract price	2,500
Value of work certified at the end of year	2,200
Cost of work not yet certified at the end of year	40
Costs incurred:	
Opening balances:	
Cost of work completed	300
Materials on site (physical stock)	10
During the year:	
Material delivered to site	610
Wages	580
Hire of plant	110
Other expenses	90
Closing balance:	
Materials on site (physical stock)	20

As soon as materials are delivered to the site, they are charged to the contract account. A record is also kept of materials as they are actually used on the contract. Periodically a stock check is made and any discrepancy between book stock and physical stock is transferred to a general contract material discrepancy account. This is absorbed back to each contract, currently at the rate of 0.5% of materials booked. The stock check at the year end revealed a stock shortage of Rs 5,000.

In addition to the direct charges listed above, general overheads are charged to contracts at 5% of the value of work certified. General overheads of Rs 15,000 has been absorbed into the cost of work completed at the beginning of the year.

It has been estimated that further costs to complete the contract will be Rs 2,20,000. This estimate includes the cost of materials on site at the end of the year just finished and also a provision for rectification.

Required:

- Determine the profitability of the above contract and recommend how much profit (to the nearest Rs '000) should be taken for the year just ended. (Provide a detailed schedule of costs.)
- State how your recommendation in (a) would be affected if the contract price was Rs 40,00,000 (rather than Rs 25,00,000) and if no estimate has been made of costs to completion. (If required, suitable assumption should be made by the candidate.)

(CA Inter, Nov. 1995)

Solution

(a) Schedule of Costs and Profit Ability

	<i>Rs '000</i>
Cost of Work Completed (Opening Balance)	300
Materials (See WN)	595

Wages	580
Hire of Plant	110
Stock Discrepancy (0.5% of Rs 595)	3
Other Expenses	90
General Overheads (5% × Rs 2,200 – Rs 15)	95
Cost of Contract to date	1,773
Add: Further Costs to complete the contract	220
Estimated Total Cost (A)	1,993
Contract Price (B)	2,500
Estimated Profit (B) – (A)	507

Profit to be taken to Costing P&L A/c

$$= \frac{\text{Estimated Profit} \times \text{Cost of work to date}}{\text{Estimated Total Cost}}$$

$$= \frac{\text{Rs } 5,07,000 - \text{Rs } 17,73,000}{\text{Rs } 19,93,000}$$

$$= \text{Rs } 4,51,034$$

Alternatively, the profit to be taken to P&L Account can be ascertained as follows:

$$= \frac{\text{Estimated Profit} \times \text{Work Certified}}{\text{Contract Price}}$$

$$= \frac{\text{Rs } 5,07,000 \times 22,00,000}{\text{Rs } 25,00,000}$$

$$= \text{Rs } 446160$$

Working Note:

Cost of Material Booked/Utilised (At Site)

Material delivered to site	Rs 6,10,000
Add: Opening balance of material at site	10,000
	6,20,000
Less: Closing balance of material at site	20,000
	6,00,000
Less: Stock shortage	5,000
Material booked (at site)	5,95,000

When the value of contract is Rs 40,00,000 and the value of work certified is Rs 22,00,000 the work completed amounts to more than 50%. The amount of profit to be taken to Costing Profit and Loss Account can be ascertained as follows (if the ratio of cash received/work certified is 80%)

$$= \text{Notional Profit} \times \frac{2}{3} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= \text{Rs } 4,67,000^* \times 2/3 \times 80/100$$

$$= \text{Rs } 2,49,067 \text{ (rounded to Rs } 2,49,000)$$

* *Notional Profit:*

$$= (\text{Value of work certified} + \text{Cost of work not certified} - \text{Cost of contract to date})$$

$$= \text{Rs } 22,00,000 + \text{Rs } 40,000 - \text{Rs } 17,73,000$$

$$= \text{Rs } 4,67,000$$

Example 9.9

Pioneer Construction Company Ltd. obtained a contract for the erection of a multi-storey building. Building operations started in July 2001. The contract price was Rs 9,00,000. On 30th June 2002, the end of the financial year, the cash received on account was Rs 3,60,000, being 80% of the amount on the surveyor's certificate.

The following additional information is given:

	Rs
Materials issued to contract	1,80,000
Materials on hand at site as on 30th June 2002	7,500
Wages	2,46,600
Plant purchased specially for contract and to be depreciated at 10% per annum	30,000
Direct expenses incurred	12,900
General overhead allocated to contract	7,600
Work finished but not yet certified: cost	15,000

You are required to prepare the contract account and statement showing the profit on the contract to 30th June 2002, indicating what proportion of the profit the company would be justified in taking to the credit of the profit and loss account, and to show what entries in respect of the contract would appear in the balance sheet.

Solution

Pioneer Construction Co. Ltd.—Multi-storey Building Contract Account

		Rs			Rs
2002			2002		
June 30	To Materials	1,80,000	June 30	By Plant at site	27,000
	To Plant	30,000		By Materials in hand	7,500
	To Wages	2,46,600		By Cost of contract c/d	4,42,600
	To Direct expenses	12,900			
	To General overheads	7,600			
		4,77,100			4,77,100
	To Cost of contract b/d	4,42,600		By Work-in-progress:	
	To Profit and loss A/c	11,946		Work certified	4,50,000
	To Work-in-progress (Reserve)	10,454		Work uncertified	15,000
		4,65,000			4,65,000

Statement Showing Computation of Profit Taken to Profit and Loss Account

Profit made to date		Rs 22,400
Profit taken to profit and loss account		
	$22,400 \times \frac{2}{3} \times \frac{80}{100}$	11,946
(since half the contract is complete 2/3rd profit as reduced on cash basis may safely be taken to the profit and loss A/c)		
Profit taken back to W.I.P. being reserve carried forward		<u>10,454</u>

Extract from the Balance Sheet as on 30th June, 2002

Assets :	Rs	
Plant at site: cost	30,000	
Less: Depreciation provided	<u>3,000</u>	Rs 27,000
Current assets:		
Work-in-progress: Work certified	4,50,000	
Work uncertified	<u>15,000</u>	
	4,65,000	
Less: Balance of profit not taken to profit and loss	<u>10,454</u>	
	4,54,546	
Less: Cash received from contractee	<u>3,60,000</u>	
	94,546	
Add: Materials at site	<u>7,500</u>	<u>1,02,046</u>

Example 9.10

The following information relates to a building contract for Rs 10,00,000.

	2001	2002
	Rs	Rs
Materials issued	3,00,000	84,000
Direct wages	2,30,000	1,05,000
Direct expenses	22,000	10,000
Indirect expenses	6,000	1,400
Work certified	7,50,000	10,00,000
Work uncertified	8,000	—
Materials at site	5,000	7,000
Plant issued	14,000	2,000
Cash recd. from contractor	6,00,000	10,00,000

The value of plant at the end of 2001 and 2002 was Rs 7,000 and Rs 5,000 respectively.

Prepare: (i) the contract account, and (ii) contractee account for two years 2001 and 2002 taking into consideration such profit for transfer to the profit and loss account as you think proper.

(B. Com. (Hons), Delhi)

Solution

Contract Account for 2001

	Rs		Rs
To Materials issued	3,00,000	By Materials at site	5,000
To Direct wages	2,30,000	By Plant at site	7,000
To Direct expenses	22,000	By Work-in-progress:	
To Indirect expenses	6,000	Work certified	7,50,000
To Plant issued	14,000	Work uncertified	8,000
To Profit c/d	1,98,000		<u>7,58,000</u>
	<u>7,70,000</u>		<u>7,70,000</u>
To Profit and loss A/c	1,05,600 *	By Profit b/d	1,98,000
To Work-in-progress	92,400		
	<u>1,98,000</u>		<u>1,98,000</u>

Profit taken to profit and loss account: $\text{Total Profit} \times \frac{2}{3} \times \frac{\text{Cash Received}}{\text{Work Certified}}$

$$= \text{Rs } 1,98,000 \times \frac{2}{3} \times \frac{6,00,000}{7,50,000}$$

Contract Account for 2002

	Rs		Rs
To Materials at site b/d	5,000	By Materials at site	7,000
To Plant at site b/d	7,000	By Plant at site	5,000
To Work-in-progress b/d	6,65,600	By Contractee A/c	10,00,000
To Materials issued	84,000		
To Direct wages	1,05,000		
To Direct expenses	10,000		
To Indirect expenses	1,400		
To Plant issued	2,000		
To Profit and loss A/c	1,32,000		
	<u>10,12,000</u>		<u>10,12,000</u>

Contractee's Account for 2001 and 2002

	2001 Rs		Rs
2001			
To Balance c/d	6,00,000	By Bank	6,00,000
	<u>6,00,000</u>		<u>6,00,000</u>
2002			
To Contract A/c	10,00,000	By Balance b/d	6,00,000
		By Bank	4,00,000
	<u>10,00,000</u>		<u>10,00,000</u>

Example 9.11

Alcon Construction Company Ltd. commenced its business of construction on 1.1.2001. The Trial balance as on 31.12.2001 showed the following balances:

	<i>Dr. (Rs)</i>	<i>Cr. (Rs)</i>
Paid up share capital		1,00,000
Cash received on account of contract (80% of work certified)		1,20,000
Land and buildings	30,000	
Machinery at cost (75% at site)	40,000	
Bank	4,000	
Materials at site	40,000	
Direct labour	55,000	
Expenses at site	2,000	
Lorries and vehicles	30,000	
Furniture	1,000	
Office equipment	10,000	
Postage and telegrams	500	
Office expenses	2,000	
Rates and taxes	3,000	
Fuel and power	2,500	
	<u>2,20,000</u>	<u>2,20,000</u>

The contract price is Rs 3,00,000 and work certified is Rs 1,50,000. The work completed 'since certification' is estimated at Rs 1,000 (at cost). Machinery costing Rs 2,000 was returned to stores at the end of the year. Stock of materials at site on 31.12.2001 was of the value of Rs 5,000. Wages outstanding were Rs 200. Depreciation on machinery at 10%.

You are required to calculate the profit from the contract and show how the work-in-progress will appear in the balance sheet as on 31.12.2001.

(B. Com. (Hons), Delhi)

Solution

**Alcon Construction Company Ltd.
Contract Account**

<i>Dr.</i>	Rs		Rs	<i>Cr.</i>
To Materials	40,000	By Work certified		1,50,000
To Direct labour	55,000	By Work uncertified		1,000
To Expenses	2,000	By Materials at site		5,000
To Wages outstanding	200	By Machinery		
To Fuel & power	2,500	At site	25,200	
To Machinery at site	30,000	Returned to stores	1,800	27,000
To Balance c/d	53,300			
	<u>1,83,000</u>			<u>1,83,000</u>
To Profit & Loss A/c	28,427	By Balance b/d		53,300
To Work-in-progress (Reserve)	24,873			
	<u>53,300</u>			<u>53,300</u>

1. Profit taken to P&L A/c

$$\begin{aligned} \text{Profit} &= \text{Notional profit} \times \frac{\text{Cash received}}{\text{Work certified}} \times \frac{2}{3} \\ &= 53,300 \times \frac{80 \times 2}{100 \times 3} = \text{Rs } 28427 \\ &= 53,300 - \text{Rs } 28427 = \text{Rs } 24873 \end{aligned}$$

Balance Sheet as on 31st Dec. 2001

Assets :	
Work-in-progress:	Rs
Work certified	1,50,000
Cost of work Uncertified	1,000
	<u>1,51,000</u>
Less: Reserve	24,873
	<u>1,26,127</u>
Less cash received from contractee	1,20,000
	<u>6,127</u>

Example 9.12

The following is the trial balance of Cosmos Construction Limited, engaged in the execution of Contract No. 303, for the year ended 31st December, 2001.

	Rs	Rs
Contractee's Account: 75% of work certified		3,60,000
Accumulated depreciation account		50,000
Creditors		12,000
Buildings	2,00,000	
Bank balance	45,000	
Share capital		5,00,000
Materials	2,00,000	
Wages	1,80,000	
Expenses	47,000	
Plant	2,50,000	
	<u>Rs 9,22,000</u>	<u>9,22,000</u>

The work on Contract No. 303 was commenced on 1st January, 2001.

Materials costing Rs 1,70,000 were sent to the site of the contract but those costing Rs 6,000 were destroyed in an accident. Plant costing Rs 50,000 was used on the contract all through the year. Plant with a cost of Rs 2 lakhs was used from 1st January to 30th September, 2001 and was then returned to the stores.

The contract was for Rs 6,00,000 and the contractee pays 75% of the work certified. The cost of work uncertified was estimated to be Rs 15,000 on 31st December, 2001, on which data materials costing Rs 4,000 were at the site of the contract.

Expenses are charged to the contract at 25% of wages. Plant is to be depreciated at 10% according to the straight line method for the entire year.

Prepare Contract No. 303 Account for the year 2001 and make out the Balance Sheet of Cosmos Construction Limited as on 31st December, 2001. (B. Com. (Hons), Delhi)

Solution

Cosmos Construction Co.
Contract No. 303 A/c

Particulars	Rs	Particulars	Rs
To Materials issued	1,70,000	By Work-in-progress	
To Wages	1,80,000	Certified	4,80,000
To Expenses (25% of wages)	45,000	Uncertified	15,000
To Depreciation of plant			4,95,000
10% on Rs 50,000 = 5,000		By materials at site	4,000
10% on Rs 2,00,000 = 15,000	20,000	By materials destroyed	6,000
(for 9 months)			
To Balance c/d	90,000		
	5,05,000		5,05,000
To Profit & Loss A/c	45,000	By Balance b/d	90,000
To Reserve	45,000		
	90,000		90,000

Transfer to Profit and Loss A/c is calculated as under = Rs 90,000 $\times \frac{75}{100} \times \frac{2}{3}$ = Rs 45,000.

Work certified: Contractee pays 75% of the work certified. Hence work certified will be Rs 4,80,000

$\left(3,60,000 \times \frac{100}{75}\right)$. Rs 3,60,000 has been paid to the contractor.

Profit and Loss A/c

Particulars	Rs	Particulars	Rs
To Materials destroyed	6,000	By Contract A/c	45,000
To Depreciation A/c	5,000		
(Not charged to contract)			
To Unabsorbed expenses	2,000		
To Balance c/d	32,000		
	45,000		45,000

Balance Sheet as on 31st December 2001

	Rs		Rs
Capital	5,00,000	Bank balance	45,000
Profit & Loss A/c	32,000	Building	2,00,000
Creditors	12,000	Materials	30,000
		Materials at site	4,000
		Work-in-progress:	
		Work certified	4,80,000
		Uncertified	15,000
			4,95,000
		Less: Reserve	45,000
			4,50,000
		Less: Cash received	3,60,000
			90,000
		Plant	2,50,000
		Less: Depreciation	75,000
		(50,000 + 20,000 + 5,000)	1,75,000
	5,44,000		5,44,000

Example 9.13

Surya Construction Ltd. with a paid up share capital of Rs 50 lakhs undertook a contract to construct MIG apartments. The work commenced on the contract on 1st April 2000. The contract price was Rs 60 lakh. Cash received on account of the contract upto 31st March, 2001 was Rs 18 lakh (being 90% of the work certified). Work completed but not certified was estimated at Rs 1,00,000. As on 31st March 2001 material at site was estimated at Rs 30,000, machinery at site costing Rs 2,00,000 was returned to stores and wages outstanding were Rs 5,000. Plant and machinery at site is to be depreciated at 5%.

The following were the ledger balances (Dr.) as per trial balance as on 31st March 2001:

	Rs
Land and Building	23,00,000
Plant and Machinery (60% at site)	25,00,000
Furniture	60,000
Materials	14,00,000
Fuel and Power	1,25,000
Site expenses	5,000
Office expenses	12,000
Rates and taxes	15,000
Cash at Bank	1,33,000
Wages	2,50,000

Prepare the Contract Account and Balance Sheet.

(B. Com. (Hons), Delhi 2001)

Solution

Contract Account

Dr.		Rs		Cr.	Rs
To Materials	14,00,000		By Work Certified		
Less: Material at site	(-) 30,000	13,70,000	$\frac{18,00,000 \times 100}{90}$		
			= 20,00,000		
To Wages	2,50,000		By Work Uncertified		
Add O/s	+ 5,000	2,55,000	= 1,00,000		21,00,000
To Fuel & Power		1,25,000			
To Site Expenses		5,000			
To Office Expenses		12,000			
To Rates & Taxes		15,000			
To Depreciation on Machine at Site					
$\left(\frac{25,00,000 \times 60 \times 5}{100 \times 100} \right)$		75,000			
To Balance c/d		2,43,000			
		<u>21,00,000</u>			<u>21,00,000</u>
To Profit and Loss A/c			By Balance b/d		2,43,000
$2,43,000 \times \frac{1}{3} \times \frac{90}{100}$		72,900			
To Reserve transferred to W/P		1,70,100			
		<u>2,43,000</u>			<u>2,43,000</u>

Working Notes (1) Work Certified

Rs

$$\frac{18,00,000 \times 100}{90} = 20,00,000$$

$$\text{Less: Cash Received} = 18,00,000$$

2,00,000

$$\text{Less: Profit transferred to WIP} = 1,70,100$$

29,900

$$\text{Add: Work uncertified} = 1,00,000$$

1,29,900

$$\text{Work-in-Progress} = 1,29,900$$

(2) No depreciation has been charged on Land and Building and furniture as the same have not been shown at site.

(3) Machinery returned to stores Rs 2,00,000 – 5% of Rs 2,00,000

$$= \text{Rs } 2,00,000 - 10,000$$

$$= \text{Rs } 1,90,000$$

Balance Sheet
as on 31st March 2001

<i>Liabilities</i>	<i>Amt.</i>	<i>Assets</i>	<i>Amt.</i>
Authorised and subscribed Capital	—	Work in progress (1)	1,29,900
Issued and paid up Capital	50,00,000	Land and Building	23,00,000
O/S Wages	5,000	Machinery At Site	15,00,000
Profit and loss A/c	72,900	(-) Depreciation	(-) 75,000
		<u>14,25,000</u>	
		(-) Returned	(-) 1,90,000
		<u>12,35,000</u>	12,35,000
		Machinery At office	10,00,000
		(+) Returned from site	+ 1,90,000
		<u>11,90,000</u>	11,90,000
		Furniture	60,000
		Bank	1,33,000
		Materials at site	30,000
	<u>50,77,900</u>		<u>50,77,900</u>

Example 9.14

MNP Construction Ltd. commenced a contract on April 1, 1999. The total contract was for Rs 17,50,000. It was decided to estimate the total profit and to take to the credit of P/L A/c the proportion of estimated profit on cash basis, which work completed bore to the total contract. Actual expenditure in 1999–2000 and estimated expenditure in 2000–2001 are given below:

	1999–2000 (Actuals) Rs	2000–2001 (Estimated) Rs
Materials issued	3,00,000	5,50,000
Labour : Paid	2,00,000	2,30,000
: Outstanding at end	20,000	30,000
Plant purchased	1,50,000	—
Expenses : Paid	75,000	1,50,000
: Prepaid at end	15,000	—
Plant returned to store (historical cost)	50,000	1,00,000
		(on Dec. 31, 2000)
Material at site	20,000	50,000
Work certified	8,00,000	Full
Work uncertified	25,000	—
Cash received	6,00,000	Full

The plant is subject to annual depreciation @ 25% of WDV Cost. The contract is likely to be completed on Dec. 31, 2000. Prepare the Contract A/c. Determine the profit on the contract for the year 1999–2000 on prudent basis, which has to be credited to P/L A/c. (CA Inter, May 2000)

Solution

MNP Construction Ltd.
Contract Account (1st April, 1999 to 31st March, 2000)

Dr.		Amount	Particulars	Amount	Cr.
	(Rs)	(Rs)		(Rs)	
To Materials issued		3,00,000	By Plant returned to store	37,500	
To Labour: Paid	2,00,000		(Refer to working note 1)		
Outstanding	20,000	2,20,000	By Materials at site	20,000	
To Plant purchased		1,50,000	By Work certified	8,00,000	
(Refer to Working note 4)			By Work uncertified	25,000	
To Expenses		60,000	By Plant at site	75,000	
To Notional profit c/d		2,27,500	(Refer to working note 2)		
		<u>9,57,500</u>		<u>9,57,500</u>	
To Profit and Loss A/c		66,321.43	By Notional profit b/d	2,27,500.00	
(Refer to working note 5)					
To Work-in-Progress A/c		1,61,178.57			
(Profit in reserve)					
		<u>2,27,500.00</u>		<u>2,27,500.00</u>	

MNP Construction Ltd.
Contract Account
(1st April, 1999 to 31st December, 2000)
(For computing estimated profit)

Dr.		Amount	Particulars	Amount	Cr.
	Rs	Rs		Rs	
To Materials issued	8,50,000		By Materials at site	50,000	
(Rs 3,00,000 + Rs 5,50,000)			By Plant returned to store on	37,500	
To Labour (paid & outstanding)	4,80,000		31st March 2000		
(Rs 2,20,000 + Rs 2,30,000 +			(Refer to working note 1)		
Rs 30,000)			By Plant returned to store	60,937.50	
To Plant purchased	1,50,000		on 31st December, 2000		
To Expenses	2,25,000		(Refer to working note 3)		
(Rs 60,000 + Rs 1,65,000)			By Contractee's A/c	17,50,000	
To Estimated profit	1,93,437.50				
	<u>18,98,437.50</u>			<u>18,98,437.50</u>	

Working notes:

1. Value of the plant returned to store on 31st March, 2000	Rs
Historical cost of the plant returned	50,000
Less: Depreciation @ 25% of WDV cost for 1 year	12,500
Value of the plant returned to store on 31st March, 2000	<u>37,500</u>

2. Value of plant at site:	Rs
Historical cost of the plant at site	1,00,000
<i>Less:</i> Depreciation @ 25% of WDV cost for 1 year	25,000
Value of the plant at site on 31st March, 2000	75,000
3. Value of the plant returned to store on 31st December, 2000	Rs
Value of the plant on 31st March, 2000	75,000.00
<i>Less:</i> Depreciation @ 25% of WDV for a period of 9 months	14,062.50
Value of the plant on 31.12.2000	60,937.50
4. Expenses paid:	75,000
Total expenses paid	15,000
<i>Less:</i> Prepaid expenses at end	60,000
Expenses paid for the year 1999–2000	60,000
5. Profit to be credited to P/L A/c on 31st March, 2000 for the contract likely to be completed on 31st December, 2000	

$$\begin{aligned}
 & \text{Estimated profit} \times \frac{\text{Cash received}}{\text{Work certified}} \times \frac{\text{Work certified}}{\text{Total contract price}} \\
 &= \text{Rs } 1,93,437.50 \times \frac{\text{Rs } 6,00,000}{\text{Rs } 8,00,000} \times \frac{\text{Rs } 8,00,000}{\text{Rs } 17,50,000} \\
 &= \text{Rs } 66,321.43
 \end{aligned}$$

Example 9.15

A contractor, who prepares his account on 31st December each year, commenced a contract on 1st April, 2001. The costing records concerning the said contract reveal the following information on 31st December, 2001.

Materials charged to site	Rs 2,58,100
Labour engaged	5,60,500
Foremen's salary	79,300

Plants costing Rs 2,60,000 had been on site for 146 days. Their working life is estimated at 7 years and their final scrap value at Rs 15,000. A supervisor, who is paid Rs 4,000 p.m., has devoted approximately three-fourths of his time to this contract. The administrative and other expenses amounts to Rs 1,40,000. Materials in hand at site on 31st December, 2001 cost Rs 25,400. Some of the material costing Rs 4,500 was found unsuitable and was sold for Rs 4,000 and a part of the plant costing Rs 5,500 (on 31.12.2001) unsuited to the contract was sold at a profit of Rs 1,000.

The contract price was Rs 22,00,000 but it was accepted by the contractor for Rs 20,00,000. On 31st December, 2001 two-thirds of the contract was completed. Architect's certificate had been issued covering 50% of the contract price and Rs 7,50,000 has so far been paid on account. Prepare contract account and state how much profit or loss should be included in the financial accounts to 31st December, 2001. Workings should be clearly given. Depreciation is charged on time basis. (CA Inter)

Solution

Contract Account
(From April 1, Dec. 31 2001)

Particulars	Rs	Particulars	Rs
To Materials	2,58,100	By Materials at site	25,400
To Labour engaged	5,60,500	By Materials sold	4,000
To Foreman's salary	79,300	By Profit and Loss A/c	500
To Supervisor's salary (WN:1)	27,000	(Loss on sale of materials)	
To Depreciation of Plant (WN: 2)	14,000	By Cost of work done c/d	10,49,000
To Administrative and other expenses	1,40,000		
	10,78,900		10,78,900
To Cost of work done b/d	10,49,000	By Work-in-progress:	
To Profit c/d	2,13,250	Work certified (WN: 3)	10,00,000
		Work uncertified (WN: 3)	2,62,250
	12,62,250		12,62,250
To Profit and Loss A/c	1,06,625	By Profit b/d	2,13,250
($2,13,250 \times 2/3 \times 7,50,000/10,00,000$)			
To work-in-progress A/c (Reserve)	1,06,625		
	2,13,250		2,13,250

Contractee's Account

To Balance c/d	Rs 7,50,000	By Bank	Rs 7,50,000
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Extracts from Balance Sheet as on 31st December, 2001

Liabilities	Rs	Assets	Rs
Profits and Loss A/c (WN:4)	1,07,125	Work-in-progress:	
		Work certified	10,00,000
		Work uncertified	2,62,250
			12,62,250
		Less: Reserve	1,06,625
			11,55,625
		Less: Cash received	7,50,000
			4,05,625
		Material at site	25,400
		Plant at site (WN-5)	2,40,500

Working Notes:

1. Supervisor's Salary: $3/4$ (9 months \times Rs 4,000) = Rs 27,000
2. Depreciation of Plant: $(Rs\ 2,60,000 - Rs\ 15,000)/7\ years \times 146/365 = Rs\ 14,000$
3. Cost of Work Uncertified:
Cost of 2/3rd of the contract is Rs 10,49,000
The estimated cost of the total contract will amount to $Rs\ 10,49,000 \times 3/2 = Rs\ 15,73,500$
Cost of 50% of the contract, as certified by the architect would be $Rs\ 15,73,500/2 = Rs\ 7,86,750$.

Cost of Work done but uncertified would, therefore be, Rs 10,49,000 – Rs 7,86,750 = Rs 2,62,250.

4. Profit and Loss Account

To Contract A/c (Loss on sale of materials)	Rs 500	By Contract A/c (Profit transferred)	Rs 1,06,625
To Balance c/d	1,07,125	By Profit on sale of Plant	1,000
	<u>1,07,625</u>		<u>1,07,625</u>

5. Plant Account

To Balance b/d	Rs 2,60,000	By Contract A/c (Depreciation)	Rs 14,000
To Profit and Loss A/c (Profit on sale of plant)	1,000	By Bank (Sale)	6,500
		By Balance c/d	2,40,500
	<u>2,61,000</u>		<u>2,61,000</u>

Example 9.16

The contract Ledger of Alpha Co. revealed the following expenditure on account of contract on 31st December, 2000.

	Rs
Materials	2,10,000
Plant	70,000
Wages	2,93,000
Expenses	15,000
Establishment charges	10,000

The contract was started on 1st Jan., 2000 and the contract price was Rs 10,00,000. Cash received to date was Rs 4,80,000 representing 80% of the work certified, the remaining 20% being retained until completion. The value of plant on 31st December, 2000 was Rs 20,000 and the value of material on hand was Rs 6,000. The cost of work finished but not certified on the said date was Rs 50,000.

Some of the materials, costing Rs 20,000 were found unsuitable and were sold for Rs 16,000 and a part of the plant costing Rs 5,000 unsuited to the contract was sold at a profit of Rs 1,000.

In order to calculate the profit made on the contract to 31st December, 2000 the contractors estimated further expenditure that would be incurred in completing the contract and took to the credit of Profit and Loss Account for the year that proportion of the estimated net profit to be realised on the contract which the value of work certified bore to the contract price.

The estimates were as under;

- that the contract would be completed by 30th June 2001.
- that a further sum of Rs 30,000 would have to be spent on plant and the residual value of the plant on the completion of the contract would be Rs 12,000.
- the materials in addition to those on hand on 31st December, 2000 would cost Rs 1,00,000 and that further sundry expenses of Rs 7,000 would be incurred.
- that the wages on the contract for the six months to June, 2001 would amount to Rs 1,69,900.
- that the establishment charges would cost the same amount per month as in the previous year.
- that Rs 18,000 would be sufficient to meet the contingencies.

Prepare the contract account for the year ended 31st December, 2000 and show your calculations of the profit to be credited to Profit and Loss Account of the year.

Solution

Contract A/c
(for the year ended 31.12. 2000)

2000	Rs	2000	Rs
To Materials	2,10,000	By materials sold	16,000
To Wages	2,93,000	By P and L A/c	
To Plant	70,000	(Loss on material sold)	4,000
To Sundry expenses	15,000	By Plant sold	6,000
To Establishment charges	10,000		
To P and L A/c (Profit on plant sold)	1,000	By Plant on site	20,000
To Balance c/d	1,03,000	By Material in hand	6,000
		By Work-in-progress A/c :	
		Work certified	6,00,000
		Work uncertified	50,000
	<u>7,02,000</u>		<u>6,50,000</u>
			<u>7,02,000</u>
2000, Dec. 31		2000 Dec. 31	
To P and L A/c		By Balance b/d	1,03,000
Profit Rs $\frac{1,09,100 \times 6,00,000}{10,00,000}$	65,460		
To Work-in-progress (Balance of Profit)	37,540		
	<u>1,03,000</u>		<u>1,03,000</u>

Estimated Contract A/c on Completion

	Rs		RS
To Materials (2,10,000 + 1,00,000)	3,10,000	By Materials sold	16,000
To Wages (2,93,000 + 1,69,000)	4,62,900	By P and L A/c (loss on materials sold)	4,000
To Plant (70,000 + 30,000)	1,00,000	By Plant sold	6,000
To P and L A/c: Plant sold	1,000	By Plant at the close	12,000
To Sundry Exp. (15,000 + 7,000)	22,000	By Contractee's A/c :	
To Establishment charges (10,000 + 5,000)	15,000	Contract price	10,00,000
To Contingencies	18,000		
To P and L A/c:			
Profit on completion estimated	1,09,100		
	<u>10,38,000</u>		<u>10,38,000</u>

Example 9.17 (Escalation Clause)

Deluxe Limited undertook a contract for Rs 5,00,000 on 1st July 2001. On 30th June 2002, when the accounts were closed, the following details about the contract were gathered:

Materials purchased	Rs 1,00,000
Wages paid	45,000
General expenses	10,000

Plant purchased	50,000
Materials on hand 30.6.2002	25,000
Wages accrued 30.6.2002	5,000
Work certified	2,00,000
Cash received	1,50,000
Work uncertified	15,000
Depreciation of plant	5,000

The above contract contained an escalation clause which reads as follows:

“In the event of prices of materials and rates of wages increase by more than 5% the contract price will be increased accordingly by 25% of the rise in the cost of materials and wages beyond 5% in each case”.

It was found that since the date of signing the agreement the prices of materials and wage rates increased by 25%. The value of the work certified does not take into account the effect of the above clause.

Prepare the contract account. Workings should form part of the answer.

(ICWA Inter, CA Inter)

Solution

Contract Account		Rs	
	Rs		
To Materials	1,00,000	By Work-in-progress:	
To Wages (45,000 + 5,000)	50,000	Work certified	2,00,000
To General expenses	10,000	Work uncertified	15,000
To Depreciation on plant	5,000	Contract escalation (Working Note 1)	5,000
To Profit:		By Materials in hand	25,000
Transferred to P and L (Working Note 2)	20,000		
Taken to WIP	60,000		
	2,45,000		2,45,000

Working Notes:

1. Escalation charges:

(a) Materials

Effect of increase in price of materials	Total increase (Rs)	Upto 5% (Rs)	Beyond (Rs)
	$75,000 \times 25/125$	$75,000 \times 5/125$	
	= 15,000	= 3,000	= 12,000

(b) Wages

Effect of increase in wage rates	$50,000 \times 25/125$	$50,000 \times 5/125$	
	= 10,000	= 2,000	= 8,000
Total increase (a) + (b)	= 25,000	= 5,000	= 20,000

Increase in contract

Price (25% of increase beyond 5%) $20,000 \times 25/100 = \text{Rs } 5,000$

2. Computation of profit transferred to Profit and Loss Account: Since more than 1/4th but less than 1/2 of the contract has been completed, 1/3 of the profit earned as reduced on cash basis has been

transferred to Profit and Loss Account.

$$80,000 \times \frac{1}{3} \times \frac{1,50,000}{2,00,000} = \text{Rs } 20,000$$

Example 9.18

A construction company undertaking a number of contracts, furnished the following data relating to its uncompleted contracts as on 31st March, 1996:

Particulars	(Rs in lacs)			
	Contract Numbers			
	723	726	729	731
Total Contract Price	23.20	14.40	10.08	28.80
Estimated Costs on completion of contract	20.50	11.52	12.60	21.60
Expenses for the year ended 31.3.96:				
Direct Materials	5.22	1.80	1.98	0.80
Direct Wages	2.32	4.32	3.90	2.16
Overheads (excluding Depreciation)	1.06	2.60	2.62	1.05
Profit Reserve as on 1.4.95	0.75	—	—	—
Plant issued at Cost	5.00	3.50	2.75	3.00
Material at Site on 1.4.95	0.75	—	—	—
Materials at Site on 31.3.96	0.45	0.20	0.08	0.05
Work Certified till 31.3.95	4.65	—	—	—
Work Certified during the year 1995-96	12.76	13.26	7.56	4.32
Work uncertified as on 31.3.96	0.84	0.24	0.14	0.18
Progress payments received during the year	9.57	9.00	5.75	3.60

Depreciation @ 20% per annum is to be charged on plant issued. While the Contract No. 723 was carried over from last year, the remaining contract were started in the 1st week of April, 1995. Required:

- Determine the profit/loss in respect to each contract for the year ended 31st March, 1996
- State the profit/loss to be carried to Profit and Loss A/c for the year ended 31st March, 1996.

(C.A. Inter Nov. 1996)

Solution

(i) Statement of Profit/Loss in Respect of Contracts for the year ended 31st March, 1996

(Rs in lacs)

Particulars		Contract Numbers			
		723	726	729	731
A. Contract Completion percentage:					
Work certified:	(a)	17.41	13.26	7.56	4.32
Contract Price:	(b)	23.20	14.40	10.08	28.80
Percentage of completion:	[(a) – (b)]	75.04	92.08	75.00	15.00
B. Estimated Profit on completion:					

(Contd)

Contract Price:	(c)	23.20	14.40	10.08	28.80
Estimated Costs on completion	(d)	20.50	11.52	12.60	21.60
Estimated Profit (Loss) on completion:	[(c) - (d)]	2.70	2.88	(2.52)	7.20
C. Profits of the year:					
Op. Stock of Materials		0.75	-	-	-
Materials issued		5.22	1.80	1.98	0.80
Direct Wages		2.32	4.32	3.90	2.16
Overheads		1.06	2.60	2.62	1.05
Depreciation		1.00	0.70	0.55	0.60
Total (1)		10.35	9.42	9.05	4.61
Profit in Reserve		1.50	-	-	-
Material at site on 31.3.96		0.45	0.20	0.08	0.05
Total (2)		1.95	0.20	0.08	0.05
Cost of contract (3)	[(1) - (2)]	8.40	9.22	8.97	4.55
Work certified		12.76	13.26	7.56	4.32
Work not certified		0.84	0.24	0.14	0.18
Total (4)		13.60	13.50	7.70	4.50
Profit (Loss) for the year	[(3)-(4)]	5.20	4.28	(1.27)	(0.05)

(ii) Profit to be taken to Profit and Loss Account of the year

$$(a) \text{ Contract 723 : } \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \frac{2}{3} \times 5.20 \times \frac{9.57}{12.76} = \text{Rs } 2.60 \text{ lacs}$$

= Balance Rs 2.60 lacs taken to Reserve

$$(b) \text{ Contract 726 : } \text{Estimated Total Profits on completion} \times \frac{\text{Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= 2.88 \times \frac{13.26}{14.40} \times \frac{9.57}{12.76} = \text{Rs } 1.80 \text{ lacs}$$

= Balance taken to Reserve Rs 2.08 lacs

(c) Contract 729 : Provision for Current Loss of Rs 1.27 lacs
Provision for Expected Loss of Rs 1.25 lacs

(d) Contract 731 : Provision for Current Loss of Rs 0.05 lac

BATCH COSTING

As stated earlier, a job order can be for an item or a number of items. In the case of the latter, the order is strictly a batch and the total batch cost must be divided by the quantity to give the cost per item. While job costing is concerned with the costing of jobs that are made to a customer's particular requirements, batch costing is used where articles are manufactured in definite batches and held in stock for sale to

customers generally. When each order is finished/completed, the cost sheet is totalled and the total cost divided by the quantity produced to show the cost per article or per dozen, etc.

ECONOMIC BATCH QUANTITY

What should be the optimum size of a batch, is an important question. If the size is higher, the unit costs may tend to decline, but the units in inventory will go up. The size of the batch influences the clerical and other machine set-up costs also. Therefore an economic batch quantity should be determined. Generally, the following formula is used which is similar in nature to economic order quantity.

$$E = \sqrt{\frac{2 U.S}{C \left(I - \frac{U}{R} \right)}}$$

Where E = Economic order quantity
 U = Annual usage in units
 S = Set-up and order processing costs
 R = Annual rate of production
 C = Cost of carrying one unit in inventory for one year

If the production of the batch is done over a short period, $\frac{U}{R}$ loses its significance and only then the following formula is applied:

$$E = \sqrt{\frac{2 U.S}{C}}$$

Example 9.19

A jobbing factory has undertaken to supply 200 pieces of a component per month for the ensuing six months. Every month a batch order is opened against which materials and labour hours are booked at actuals. Overheads are levied at a rate per labour hour. The selling price contracted for is Rs 8 per piece. From the following data, present the cost and profit per piece of each batch order and overall position of the order for 1,200 pieces.

Month	Batch output	Material cost (Rs)	Direct wages (Rs)	Direct labour (hr)
Jan.	210	650	120	240
Feb.	200	640	140	280
March	220	680	150	280
April	180	630	140	270
May	200	700	150	300
June	220	720	160	320

The other details are:

Month	Chargeable expenses (Rs)	Direct labour (hr)
Jan.	12,000	4,800
Feb.	10,560	4,400
March	12,000	5,000
April	10,580	4,600
May	13,000	5,000
June	12,000	4,800

Solution

Cost Sheet for Six Months Ending 30th June

(Output 1230 units)

Month	Jan.	Feb.	March	April	May	June	Total
Batch output (in units)	210	200	220	180	200	220	1,230
Sales value (in Rs)	1,680	1,600	1,760	1,440	1,600	1,760	9,840
Cost of materials (in Rs)	650	640	680	630	700	720	4,020
Direct wages (in Rs)	120	140	150	140	150	160	860
Chargeable expenses (in Rs)	600	672	672	621	780	800	4,145
Total cost (in Rs)	1,370	1,452	1,502	1,391	1,630	1,680	9,025
Total cost per unit (in Rs)	6.52	7.26	6.83	7.73	8.15	7.64	7.34
Profit per batch (in Rs)	310	148	258	49	-30	80	815
Profit per unit (in Rs)	1.48	0.74	1.17	0.27	-0.15	0.36	0.66

Overall position of the order for 1,200 units:

Sales value of 1,200 units @ Rs 8 Per unit

Rs 9,600

Total cost for 1,200 units @ Rs 7.34 per unit

Rs 8,808

Profit

Rs 792

Note: Chargeable expenses have been charged to different batches on the basis of direct labour hours for different months; e.g.

$$\text{For January } \frac{\text{Rs } 12000}{4800} \times 240 = 600$$

Example 9.20

Leo Limited undertakes to supply 1,000 units of a component per month for the months of January, February and March 2002. Every month a batch order is opened against which materials and labour cost are booked at actuals. Overheads are levied at a rate per labour hour. The selling price is contracted at Rs 15 per unit.

From the following data, present the profit per unit of each batch order and the overall position of the order for the 3,000 units.

Month	Batch output (Numbers)	Material cost Rs	Labour cost Rs
January 2002	1,250	6,250	2,500

February 2002	1,500	9,000	3,000
March 2002	1,000	5,000	2,000

Labour is paid at the rate of Rs 2 per hour. The other details are:

Month	Overheads	Total labour hours
January 2002	Rs 12,000	4,000
February 2002	Rs 9,000	4,500
March 2002	Rs 15,000	5,000

Solution

Leo Limited
Statement of Cost and Profit Per Unit of Each Batch

	January 2002	Feb. 2002	March 2002	Total
(a) Batch Output (Nos)	1,250	1,500	1,000	3,750
	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>
(b) Sales Value (Rs 15 per unit)	18,750	22,500	15,000	56,250
(c) Costs :				
Material	6,250	9,000	5,000	20,250
Wages	2,500	3,000	2,000	7,500
Overheads (as per note (iii) below)	3,750	3,000	3,000	9,750
Total	12,500	15,000	10,000	37,500
(d) Profit per batch (b) – (c)	6,250	7,500	5,000	18,750
(e) Cost per unit (c) ÷ (a)	10	10	10	
(f) Profit per unit (d) ÷ (a)	5	5	5	

Working Notes:

	Jan 2002	Feb. 2002	March 2002
(i) Labour hours:			
Labour cost/Labour rate per hour	$\frac{\text{Rs } 2,500}{2}$	$\frac{\text{Rs } 3,000}{2}$	$\frac{\text{Rs } 2,000}{2}$
	= 1,250	= 1,500	= 1,000
(ii) Overhead per hour:	$\frac{\text{Rs } 12,000}{4,000}$	$\frac{\text{Rs } 9,000}{4,500}$	$\frac{\text{Rs } 15,000}{5,000}$
	= Rs 3	= Rs 2	= Rs 3
(iii) Overhead for the batch (i) × (ii)	Rs 3,750	Rs 3,000	Rs 3,000

Overall Position of the Order for 3,000 units

Sales value (3,000 units × Rs 15)	Rs 45,000
Less: Total cost (3,000 units × Rs 10)	Rs 30,000
Profit	Rs 15,000

Example 9.21

A work order for 500 units of a commodity has to pass through four different machines of which the machines hour rates are

	Rs
No. I	1.25
No. II	3.00
No. III	4.00
No. IV	2.50

The following expenses have been incurred on the work order. Materials Rs 20,000 and wages Rs 1,500.

Machine	I	Worked for	200	hours
Machine	II	Worked for	300	hours
Machine	III	Worked for	240	hours
Machine	IV	Worked for	100	hours

After the work order had been executed, materials worth Rs 1,000 were returned to stores.

Office overheads are to be estimated @ 60% of works cost: 10% of the production is going to be discarded, being unsatisfactory for which 1/2 the amount can be realised from sale in the junk market. Find out the rate of selling price per unit if 20% profit on selling price is desired.

Solution

Statement Showing Cost and Selling Price for 500 Units

	Rs	Rs	Rs
Material used	20,000		
— Less returned	1,000		19,000
Wages			1,500
Prime Cost			20,500
Work Overhead: Hours × Rate			
Machine No. I 200 × Rs 1.25		250	
Machine No. II 300 × Rs 3.00		900	
Machine No. III 240 × Rs 4.00		960	
Machine No. IV 100 × Rs 2.50		250	2,360
Work Cost			22,860
Office Overheads: "			13,716
60% of works cost			36,576
Less: Sale of discarded units			
10 % discarded	Rs 3657.60		
Half to be realised	1828.80		
Loss	1,828.80		1828.80
Total Cost			34,747.20
Profit 20% on selling price or 25% on cost			8,686.80
Sales			43,434.00
Selling Price per unit			

$$\frac{\text{Rs } 43,434}{500} = \text{Rs } 86.86 \text{ ap.}$$

Note: It has been presumed that net resulted output is 500, i.e., the quantum of work order, after the discarded units have been adjusted for.

THEORY QUESTIONS

- What is the nature of job costing? How are the costs recorded on job orders?
 - Explain the meaning of contract costing and batch costing.
- Indicate how you would deal with the following items:
 - Plant and machinery purchased and used on contract work.
 - Amounts received from contractee.
 - Materials lying unused at site.
- Discuss the implications of cost-plus contracts from the viewpoint of:
 - Manufacturer
 - Customer
 - What is the relevance of the escalation clause provided in a contract?

SELF-EVALUATION QUESTIONS

- Choose the correct answer for the following multiple-choice questions:
 - Which of the following production activities would be most likely to employ job order costing?
 - Ship building
 - Candy manufacturing
 - Toy manufacturing
 - Crude oil refining
 - In job-order costing, the basic document to accumulate and ascertain the cost of each order is the
 - Purchase order
 - Requisition sheet
 - Invoice
 - Job cost sheet
 - Which of the following will not be used in job-order costing?
 - Standards
 - Marginal costing
 - Averaging of direct labour and material rates
 - Factory overhead allocation based on direct labour hours applied to the job.

PROBLEMS

Job costing

- The following information for the year ending December 31, 2001 is obtained from the books and records of a factory:

	<i>Completed jobs</i>	<i>Work-in-progress</i>
	Rs	Rs
Raw materials supplied from stores	90,000	30,000

Wages	1,00,000	40,000
Chargeable expenses	10,000	4,000
Materials transferred to work-in-progress	2,000	2,000
Materials returned to stores	1,000	

Factory overheads is 80% of wages and office overhead is 25% of factory cost.

The value of executed contracts during 2002 was Rs 4,10,000. Prepare the:

(i) consolidated completed jobs account, and (ii) consolidated work-in-progress account.

2. A factory uses a job costing system. The following data are available from the books at the year ending 31st March 2002.

	Rs
Direct material	9,00,000
Direct wages	7,50,000
Profit	6,09,000
Selling and distribution overhead	5,25,000
Administrative overhead	4,20,000
Factory overhead	4,50,000

Required:

- (a) Prepare a cost sheet indicating the prime cost, works cost, production cost, cost of sales and sales value.
- (b) In 2002-03, the factory has received an order for a number of jobs. It is estimated that the direct materials would be Rs 12,00,000 and direct labour would cost Rs 7,50,000. What would be the price for these jobs if the factory intends to earn the same rate of profit on sales, assuming that the selling and distribution overhead has gone up by 15%. The factory recovers factory overhead as a percentage of direct wages and administrative and selling and distribution overhead as a percentage of works cost, based on the cost rates prevalent in the previous year. (CA Inter)

Ans: (a) Prime cost Rs 16,50,000, Works cost Rs 21,00,000, Production cost Rs 25,20,000, Cost of sales Rs 30,45,000, Sales value Rs 36,54,000.

(b) Sales value Rs 42,84,000, Profit Rs 7,14,000.

3. According to the factory job cost ledger, Job No. A 5 has incurred the following prime costs:

Materials (direct)

14.607 kg @ Rs 2.375 per kg

Wages (direct)

Department X 18 hours Rs 3.50 per hour

Department Y 32 hours @ Rs 3.00 per hour

Budgeted overhead for the year, based on normal capacity, is as follows:

Variable overhead

Department X Rs 6,000 for 9,000 direct labour hours

Department Y Rs 8,000 for 10,000 direct labour hours

Fixed overhead

Total budgeted direct labour hours for whole factory Rs 22,000

Total budgeted expenditure Rs 16,500

You are required:

(a) to calculate the cost of Job No. A 5 and

(b) to estimate the percentage of profit obtained if the price quoted to the customer was Rs 350.

Ans: (a) Cost Rs 268.79

(b) 23.20% on selling price or 30.20% on cost price.

4. Mayur Engineering, engaged in job work, has completed all jobs in hand on 30th December, 2001 except Job No. 447. The cost sheet on 30th December showed direct materials and direct labour costs of Rs 40,000 and Rs 30,000 respectively as having been incurred on Job No. 447. The costs incurred by the business on 31st December, 2001, the last day of the accounting year, were as follows:

Direct materials (Job 447)	Rs 2,000
Direct labour (Job 447)	Rs 8,000
Indirect labour	Rs 2,000
Miscellaneous factory overhead	Rs 3,000

It is the practice of business to make the jobs absorb factory over-heads on the basis of 120 per cent of direct labour cost.

Calculate the value of work-in-progress of Job No. 447 on 31st December, 2001

(B. Com. (Hons), Delhi)

Ans: Works cost Rs 1,25,600.

Contract Casting

5. An expenditure of Rs 1,94,000 has been incurred on a contract to the end of 31st March 2001. The value of work certified is Rs 22,000. The cost of work done but not yet certified is Rs 6,000. It is estimated that the contract will be completed by 30th June 2001 and an additional expenditure of Rs 40,000 will have to be incurred to complete the contract. The total estimated expenditure on the contract is to include a provision of 2, 1/2 per cent for contingencies. The contract price is Rs 2,80,000 and Rs 2,00,000 has been realised in cash upto 31st March 2001. Find out the profit to be taken to P and L A/c as on 31st March 2001 under different methods.

Ans: (i) When the work on contract has reasonably advanced: Rs 19,394 (ii) when the contract is almost complete, there are different methods for calculation of profit to be taken to P and L A/c. Total notional profit is Rs 32,000.

6. A contractor commenced work on a particular contract on 1st April, 2001. He closes the books of accounts for the year on 31st December of each year. The following information is revealed from his costing records on 31st December, 2001.

Materials sent to site	Rs 43,000
Foreman	12,620
Labour	1,00,220

A machine costing Rs 30,000 remained in use on site for 1/5th of the year. Its working life was estimated at 5 year and scrap value at Rs 2,000.

A supervisor is paid Rs 2,000 per month and had devoted half of his time on contract.

All other expenses were Rs 14,000. The materials on site were Rs 2,500. The contract price was Rs 4,00,000.

On 31st December, 2001, 2/3rd of the contract was completed. However, the architect gave certificate only for Rs 2,00,000 on which 80% was paid. Prepare contract account.

Ans: Profit transferred to P & L A/c Rs 35,683.

Profit transferred to Reserve 31,222.

Hint:

1. Depreciation on plant

$$\frac{\text{Rs } 30,000 - \text{Rs } 2,000}{5 \times 5} = \text{Rs } 1,120$$

2. Cost of work uncertified

Expenditure incurred to date	Rs 1,79,960
Less: Materials at site	2,500
	1,77,460

Rs 1,77,460 represents the cost of completing 2/3 of the total contract. Thus the estimated cost of the total contract will amount to Rs 2,66,190 (i.e. $1,77,460 \times 3/2$).

The architect's certificate represents 1/2 of the contract price. It therefore covers an expenditure of Rs 1,33,095 (i.e. $2,66,190 \times 1/2$).

The cost of work uncertified is, therefore, Rs 44,365 (i.e. $Rs\ 1,77,460 - Rs\ 1,33,095$)

3. Profit taken to profit and loss account.

$$= 66,905 \times \frac{2}{3} \times \frac{80}{100}$$

$$= Rs\ 35,683 \text{ (approx.)}$$

7. From the information given below relating to an unfinished contract, ascertain:

- Profit on work certified.
- Cost of work-in-progress at the end of year.

	Rs
Materials sent to site	86,000
Labour engaged on site	65,000
Plant issued	80,000
Direct expenses	8,000
Establishment charges	4,000
Materials returned to stores	600
Work certified	1,90,000
Uncertified work	7,700
Materials in hand	2,000
Wages accrued	300
Cash received	1,61,500
Depreciation of plant	7,000

Ans: Profit Rs 20,000.

(ICWA Inter)

8. Thekedar accepted a contract for the construction of a building for Rs 10,00,000, the contractee agreeing to pay 90% of work certified as complete by the architect. During the first year, the amounts spent were:

	Rs
Materials	1,20,000
Labour	1,50,000
Machinery	30,000
Other Expenses	90,000

At the end of the year, the machinery was considered to be of a value Rs 20,000, and materials at site were of the value of Rs 5,000. Work certified during the year totalled Rs 4,00,000. In addition, work-in-progress, but not certified at the end of the year, had cost Rs 15,000.

Prepare the contract account in the books of Thekedar. Also show the various figures of profit that can be transferred reasonably to the profit and loss account. (B. Com. Delhi)

Ans: Profit Rs 15,000, Profit in reserve Rs 35,000.

9. M/s Raju and Mohan Contractors Ltd. were engaged on one contract during the year 2001. The contract price was Rs 4,00,000. The Trial Balance extracted from their books on 31st December, 2001 stood as follows:

Share Capital		Rs 80,000
Sundry Creditors		8,000
Land & Buildings	Rs 34,000	
Bank	9,000	

Contract Account:	
Materials	75,000
Plant	20,000
Wages	1,05,000
Expenses	5,000
Cash received being 80% of work certified	1,60,000
	<u>2,48,000</u>
	<u>2,48,000</u>

Of the Plant and Materials charged to the contract, Plant costing Rs 3,000 and materials costing Rs 2,400 were destroyed by an accident.

On 31st December, 2001. Plant which cost Rs 4,000 was returned to the store, the value of materials on site was Rs 3,000 and the cost of work done but not certified was Rs 2,000.

Charge 10% depreciation on plant. Prepare Contract Account for the year 2001 and balance sheet as on 31st December 2001.

Ans: Profit transferred to P & L A/c Rs 11,040

Profit transferred to Reserve Rs 9,660

B/S total Rs 93640

It has been presumed that plant and materials have been lost on account of accident in the beginning of the year.

10. Anand Company of builders took to a multi-storeyed structure for Rs 40,00,000, estimating the cost to be Rs 36,80,000. At the end of the year the company had received Rs 14,00,000 being 90% of the work certified; work done but not certified was Rs 40,000.

Following expenditure was incurred:

Materials	Rs 4,00,000
Labour	10,00,000
Plant	80,000

Materials costing Rs 20,000 were damaged. Plant is considered as having depreciated at 25%. Prepare contract account and show all the possible figures, that can reasonably be credited to Profit and Loss Account.

Ans: 2/3 of Rs 2,40,000 notional profit on cash basis Rs 1,44,000; Notional profit X cash received / contract price Rs 86,000; Notional profit X cost of work done / estimated total cost Rs 91,304; Notional profit X work certified / Contract price Rs 96,000.

11. SV construction Ltd. have obtained a contract for construction of a bridge. The value of the contract is Rs 12 lakhs and the work commenced on 1st October, 2001. The following details are shown in their books for the year ending 30th September 2002.

	Rs
Plant purchased	60,000
Wages paid	3,40,000
Material issued to site	3,36,000
Direct expenses	8,000
General overheads apportioned	32,000
Wages accrued as on 30.9.2002	2,800
Materials at site as on 30.9.2002	4,000
Direct expenses accrued as on 30.9.2002	1,200
Work not certified at cost	14,000
Cash received being 80% of work certified	6,00,000

Life of plant purchased is 5 years and scrap value is nil.

1. Prepare the contract account for the year ending 30th September, 2002

2. Show the amount of profit which you consider might be fairly taken on the contract and how you have calculated it.

Ans: Profit taken to Profit and Loss A/c Rs 19,200.

12. Kapoor Engineering Company undertakes a long-term contract which involves the fabrication of prestressed concrete blocks and the erection of the same on consumer's site.

The following is supplied regarding the contract which is incomplete on 31st March, 2001.

Cost incurred:

Fabrication costs to date:

Direct materials

Direct labour

Overheads

Rs

2,80,000

90,000

75,000

4,45,000

15,000

Erection costs to date

4,60,000

Total

Contract price

8,19,000

Cash received on account

6,00,000

Technical estimate of work completed to date:

Fabrication:

Direct materials 80%

Direct labour and overheads 75%

Erection 25%

You are required to prepare a statement for submission to the management indicating:

(a) the estimated profit on the completion of the contract, and

(b) the estimated profit to date on the contract.

(CA Inter)

Ans: Estimated profit Rs 1,38,000 on contract.

13. The PQR Co. Ltd. undertake to build a cooling tower at a contract price of Rs 6,75,000. It is estimated that it will take two years to complete, and work is commenced on 1st May 2001. The company's year ended on 30th September, and on that date, in 2002 the position of the contract was as follows:

		Rs 4,75,000
<i>Less:</i> 10% retention		47,500
		<hr/> 4,27,500
<i>Add:</i> Extra work over contract as agreed	Rs 3,100	
Last time	230	
		<hr/> 3,330
This time		4,30,830
<i>Less:</i> Cash paid on account		4,08,330
		<hr/> Rs 22,500
Amount now due (and paid Oct. 24, 2002)		

Expenditure on the contract was as follows:

Materials sent by suppliers direct to site

Rs 2,12,000

Materials sent from plant and stores yard

Rs 1,500

Wages

Rs 1,05,000

Haulage of plant

2,400

Expenses incurred on contract	3,800
Establishment charges apportioned to contract	30,300

On 30th September 2002 it is estimated that materials on site amounted to Rs 3,050.

During the contract, plant to the value of Rs 35,000 was transferred from the site. The plant remaining on site at 30th September was valued at Rs 32,000.

The amount of work done (at cost) between the date of the last certificate and the end of the financial year was estimated as Rs 10,250.

PQR Co. Ltd. are careful as to the amount of profit to be taken on uncompleted contracts, and as only a few months' work had been done at 30th September 2001 no profit at all was then taken.

- (a) You are required, supposing the company were to take credit for profit on the contract, to:
- Calculate the amount that you consider may be fairly taken into the firm's accounts at 30th September 2002;
 - Calculate the work-in-progress figure. How would this new figure be shown in the balance sheet of PQR Co. Ltd.?
- (b) Show the Contract Account in the firm's costing ledger to record the above facts.

Ans: Hint

(a) (i) Notional Profit Rs 1,14,630	
Profit transferred to P and L A/c Rs 65,240	
(ii) Work-in-progress: Rs 3,63,700 + Rs 10,250	Rs 3,73,950
Add net profit taken to Profit and Loss Account	<u>65,240</u>
	<u>Rs 4,39,190</u>

Balance Sheet

Work-in-progress	Rs 4,39,190	
Less: Cash paid on account	<u>RS 4,08,330</u>	Rs 30,860

(b) Contract Account

Materials from suppliers	RS 2,12,000	Plant transferred	Rs 35,000
Material from yard	1,500	Material c/d	Rs 3,050
Wages	Rs 1,05,000	Plant c/d	32,000
Haulage of plant	2,400	Work completed c/d	3,73,950
Expenses	3,800		
Plant	89,000		
Establishment charges apportioned	<u>30,300</u>		
	<u>4,44,000</u>		<u>4,44,000</u>
Balance b/d	3,73,950		
Profit transferred to profit and loss Account	<u>65,240</u>	Work-in-progress c/d	4,39,190
	<u>Rs 4,39,190</u>		<u>Rs 4,39,190</u>
Material b/d	3,050		
Plant b/d	32,000		
Work-in-progress	Rs 4,39,190		



Process Costing

NATURE OF PROCESS COSTING

Process costing is that form of operations costing which is used where standardised goods are produced in large volume with continuous production flow. This costing method is used in industries like chemicals, petroleum, textiles, steel, rubber, cement, plastic, shoes, sugar and coal. Those concerns which produce items such as screws, bolts and small electrical parts can also use this costing method. Process costing is also used in the assembly type industry which manufactures items, such as typewriters, automobiles, aeroplanes and household electrical appliances such as washing machines, refrigerators, electrical irons, radios, television sets, etc. For example, an electronics manufacturing company may have the following process or cost centres: materials set-up, wiring, and soldering. Service industries, such as gas, water, electric power and heat may also follow process cost accounting.

Characteristics

A process costing method has the following distinctive characteristics:

1. *Cost collection* Manufacturing costs are accumulated for each production department or process.
2. *Time period assumption* Manufacturing costs are accumulated by department or process for specific time periods, say a month, and the process costing is designed to measure units produced during this time period.
3. *Averaging process* The most important point is that product costing under process costing is an averaging process. The unit cost is obtained by accumulating all manufacturing costs and dividing it by units produced or some measure of production.
4. *Separate ledger* Each process or department has its own account and records the processing costs incurred by the department.
5. *Homogeneous product* Under processing industries, the production is continuous and emphasis is on uniform or standardised product. It is difficult to identify a specific unit of output with the time of production.
6. *Transfer to finished goods* Completed units and their associated costs are transferred to next process if something is still to be done on those units. Completed units are transferred to finished goods if nothing is to be done.

7. *Cost of spoiled units* Cost of lost or spoiled units is added to the cost of good units completed, thus increasing the average cost per unit.

Process Costing and Job Costing

Process costing and job costing differ on the following counts:

1. *Applicability* Job costing is applicable in situations where the objective is to identify costs with specific products or jobs. Process costing, on the other hand, is used in case of mass production of similar units that continuously pass through different departments or processes.
2. *Cost collection* In job costing, manufacturing costs are accumulated for particular jobs or batches of product using job cost sheets. In process costing, manufacturing costs are accumulated for entire departments or processes and the cost of particular jobs or batches or products is not determinable.
3. *Time period assumption* In job costing, costs are accumulated for a specific product or job without taking into account the production time which may be more than one accounting period. In process costing, costs are accumulated for specific departments/processes for a given time period (say a month). That is, production is measured for specific time periods in process costing.
4. *Purpose* In job costing production is generally dependent on customers' orders and specifications. Under process costing, production is done for storing stock of goods and for future sale.
5. *Computation of unit costs* In job costing unit cost is obtained by dividing the cost of the job order by units produced in the job order. Under process costing, unit costs are obtained by dividing departmental/process costs by process production.
6. *Work-in-progress* In job costing, one work-in-progress account is maintained. But in process costing, individual work-in-progress accounts are prepared for each production/process department to ascertain manufacturing costs by process.

COSTING PROCEDURES UNDER PROCESS COSTING

In process costing, an account is maintained for each process to which all costs of material, labour, direct expenses and overhead are debited:

Materials

In process costing all the materials required for production are issued to the first process, where after processing, they are passed on to the next process and so on; each process merely performs the same operation on the material which has been passed on from the first process. Alternatively, materials may pass from the first process to the second process, where extra or new raw materials are added; then more materials are added in the next process; this may continue until completion.

Labour

Labour costs incurred in a particular process are posted to the debit of the process account concerned. However, where workers are engaged in more than one process, the gross wages are distributed to each process on the basis of time spent on each process.

Direct Expenses

Items of expenditure which can be directly attributed to a process are debited to the relative process account. Examples of such expenses are cost of electricity, depreciation and hire charges of equipments.

Factory Overhead

Expenses which are not charged direct are apportioned on the basis of absorption rates. Also, overhead may be recovered at a predetermined rate based on direct wages, prime cost, etc.

PREPARATION OF PROCESS COST ACCOUNTS

As stated earlier, for each process an individual process account is prepared. The method of preparing process accounts is discussed herewith on the basis of the following situations which may be found in a production situation:

1. Process costing having no process loss and no opening and closing work-in-progress.
2. Process costing having process losses or gains (normal loss, abnormal loss, abnormal gain).
3. Process costing having opening and closing work-in-progress at various stages of completion. Besides, there may be process losses or gains.
4. Inter-process profits.

Process Costing Having No Process Loss and No Opening and Closing Work-in-progress

The preparation of process accounts is very easy, if no loss or gain has arisen during the processing operation of the product. All costs of material, labour, direct expense, and apportioned overhead are debited to the process account. The total (accumulated) costs of the process are transferred to the second process as raw materials (input) for that process.

Example 10.1

Prepare process cost accounts from the following data:

Items	Total	Process		
		I	II	III
Direct material	4,40,000	3,60,000	60,000	20,000
Direct wages	80,000	20,000	40,000	20,000
Direct expenses	1,00,000	60,000	—	40,000

Production overhead incurred is Rs 160,000 and is recovered on 200% of direct wages. Production during the period was 20,000 units. There was no opening or closing work-in-progress.

Solution

Process I Account

	Cost per unit	Amount		Cost per unit	Amount
To Direct material	18.00	3,60,000	By output transferred Process II	24.00	4,80,000

	<i>Cost per unit</i>	<i>Amount</i>	<i>Cost per unit</i>	<i>Amount</i>
To Direct wages	1.00	20,000		
To Direct expenses	3.00	60,000		
To Production overhead	2.00	40,000		
	<u>24.00</u>	<u>4,80,000</u>	<u>24.00</u>	<u>4,80,000</u>

Process II Account

To Output from Process I	24.00	4,80,000	By Output transferred to Process III	33.00	6,60,000
To Direct material	3.00	60,000			
To Direct wages	2.00	40,000			
To Production overhead	4.00	80,000			
	<u>33.00</u>	<u>6,60,000</u>		<u>33.00</u>	<u>6,60,000</u>

Process III Account

To Output from Process II	33.00	6,60,000	By Output transferred to finished stock	39.00	7,80,000
To Direct material	1.00	20,000			
To Direct wages	1.00	20,000			
To Direct expenses	2.00	40,000			
To Production overhead	2.00	40,000			
	<u>39.00</u>	<u>7,80,000</u>		<u>39.00</u>	<u>7,80,000</u>

Example 10.2

From the following figures show the cost of three processes of manufacture. The production of each process is passed on to the next process immediately on completion.

	<i>Process A</i>	<i>Process B</i>	<i>Process C</i>
Wages and materials	Rs 30,400	Rs 12,000	Rs 29,250
Works overheads	5,600	5,250	6,000
Production in units	36,000	37,500	48,000
Stock (Units from preceding process—1st July, 2001)		4,000	16,500
Stock (Units from preceding process—31st July, 2001)		1,000	5,500

Solution:

Process A Account

To Wages and materials	Rs 30,400	By transfer to process B	
To Works overheads	5,600	@ Re 1 per unit	
	<u>36,000</u>		<u>Rs 36,000</u>
			36,000

Process B Account

To Stock: unit from preceding process @ Re 1 per unit	Rs 4,000	By Stock: units from preceding process @ Re 1 per unit	Rs 1,000
To Transfer from Process A	36,000	By Transfer to Process C @ Rs 1.50 per unit	56,250
To Wages and material	12,000		
To Works overheads	5,250		
	<u>57,250</u>		<u>57,250</u>

Process C Account

To Stock: units from preceding process @ Rs 1.50 per unit	Rs 24,750	By Stock: units from preceding process @ Rs 1.50 per unit	Rs 8,250
To Transfer from Process B	56,250	By Transfer to finished goods account @ Rs 2 per unit	Rs 1,08,000
To Wages and materials	29,250		
To Works overheads	6,000		
	<u>1,16,250</u>		<u>Rs 1,16,250</u>

Example 10.3

The Neodrug manufacturers process a product 'plant food' through three distinct processes, the product of one process being transferred to the next process and so on to finished product intact.

Raw materials, labour and direct expenses incurred on each of the processes are given below:

Particulars	Process A	Process B	Process C
Raw materials	Rs 1,00,000	Rs 80,000	Rs 20,000
Labour	50,000	60,000	70,000
Direct expenses	15,000	25,000	50,000

The overhead expenses for the period amounted to Rs 3,60,000 and is to be distributed to the processes on the basis of labour wages.

There were no stocks in any of the processes at the beginning or at the close of the period. Ignore wastages.

(a) Assuming that the output was 1,00,000 kilos, show the process accounts of A, B and C indicating also the unit cost per kilo under each element of cost and the output in each process.

(b) If 10% of the output is estimated to be lost in the course of sale and sampling, what should be the selling price per unit (correct to two decimal place) so as to provide for gross profit of $33\frac{1}{2}\%$ on selling price.

Solution

Process A

	Per kg	Total		Per kg	Total
To Raw materials	1.00	1,00,000	By Transfer to Process B	2.65	2,65,000
To Labour	0.50	50,000			
To Direct expenses	0.15	15,000			
To Overheads	1.00	1,00,000			
	<u>2.65</u>	<u>2,65,000</u>		<u>2.65</u>	<u>2,65,000</u>

Process B

	Rs	Rs	By Transfer to	Rs	Rs
To Transfer from Process A	2.65	2,65,000	Process C	5.50	5,50,000
To Raw materials	0.80	80,000			
To Labour	0.60	60,000			
To Direct expenses	0.25	25,000			
To Overheads	1.20	1,20,000			
	<u>5.50</u>	<u>5,50,000</u>		<u>5.50</u>	<u>5,50,000</u>

Process C

	Rs	Rs	By Transfer to	Rs	Rs
To Transfer from Process B	5.50	5,50,000	finished goods		
To Raw materials	0.20	20,000	A/c	8.30	8,30,000
To Labour	0.70	70,000			
To Direct expenses	0.50	50,000			
To Overheads	1.40	1,40,000			
	<u>8.30</u>	<u>8,30,000</u>		<u>8.30</u>	<u>8,30,000</u>

(b) Cost of finished goods Rs 8,30,000

Profit ($33\frac{1}{3}\%$ on selling price) 4,15,000

Sales 12,45,000

Gross output 1,00,000 kg

Less = wastage 10% 10,000

90,000 kg

Selling price per kg = $\frac{12,45,000}{90,000}$ = Rs 13.83 per kg

90,000 kg

Process Costing Having Process Losses and/or Gains

All materials put into process are not likely to be good saleable products. Some loss, scrap and wastage is inevitable in process industries. Process loss can be divided into two categories: (i) Normal loss, (ii) Abnormal loss. Normal loss is the loss which is unavoidable, uncontrollable and expected in normal conditions. It may be inherent in the manufacturing process. Abnormal process loss is controllable and avoidable and generally caused by abnormal or unexpected conditions, such as bad designing, poor materials, accident and negligence, etc.

The treatment of normal and abnormal losses differ in process accounts. Normal losses are absorbed by good production. Assume, for example, that 25,000 units of a mixture were put into process and that during processing 5,000 units were lost through evaporation. This is an unavoidable loss. If the total cost recorded was Rs 25,00,000 the remaining 20,000 units would be assigned a unit cost of Rs 125.

$$\frac{\text{Cost of production}}{\text{Number of units completed}} = \frac{\text{Rs } 25,00,000}{20,000} = \text{Rs } 125$$

Abnormal losses are valued as good units. The unit cost which is used to value good units is also applied for valuation of abnormal loss units. The cost of abnormal loss units computed in this manner is transferred to a separate abnormal loss account and credited to relevant process account. Subsequently, this loss is transferred to the costing profit and loss account and the abnormal loss account is thus closed.

Waste

Waste is without any value. If waste is part of the normal process loss, the cost is absorbed by the good production. Alternatively, if waste represents abnormal process loss, the waste (abnormal loss) is valued like good units and treated as abnormal process loss.

Scrap

Scrap means discarded material emerging from certain manufacturing operations. It has some but minor value. Where the normal loss is in the form of scrap and has some realisable value, the process account is credited with the amount which could be realised from sale of normal scrap. The abnormal loss, if represented by scrap may have a similar realisable value. The amount realised from sale of scrap representing abnormal loss is credited to the abnormal loss account and the balance in the abnormal loss account is transferred to the costing profit and loss account. The question of crediting the amount realised from sale of scrap representing abnormal loss in the relevant process account does not arise. The relevant process account is credited and the abnormal loss account is debited with the cost of abnormal loss valued as finished output. In case there are normal loss, abnormal loss, scrap, the following procedure will help in the preparation of process accounts:

1. Normal loss should be computed on the basis of information given in the question.
2. The cost per unit of production after taking into account normal loss units should be determined assuming that abnormal loss does not exist. The cost per unit is calculated on the basis of the following information:
 - (a) Normal production, i.e. inputs (units) minus normal loss units.
 - (b) Normal cost of production, i.e. all costs incurred (appearing on the debit side of a process account) minus proceeds (if any) realised from the sale of normal loss units.Normal cost of production divided by normal production will give the cost per unit of output.
3. The cost per unit determined as above is used to value abnormal loss units and that would be the cost of abnormal loss.
4. The abnormal loss account is debited and the relevant process account credited with the amount and quantity of abnormal loss as calculated in (3) above.
5. The cost per unit as obtained in (3) will also be used to determine the cost of good production units produced by the process.
6. The proceeds realised from the sale of normal loss representing scrap is transferred to the relevant process account.
7. The proceeds realised from the sale of abnormal loss representing scrap is transferred to a separate abnormal loss account and not to the relevant process account.
8. The abnormal loss account is closed by transferring the total cost of abnormal loss units to the costing profit and loss account if there is no scrap. In case abnormal loss represents scrap, only the net amount (total cost of abnormal loss units minus scrap) will be transferred to the costing profit and loss account.

Abnormal Gain (Effectives)

Abnormal gain arises when the actual loss is less than the normal loss expected. The abnormal gain is valued in the same manner as abnormal loss and is credited to a separate account known as the abnormal gain account. The abnormal gain account appears on the debit side of the relevant process account. The amount of scrap which would otherwise have been realised, had there been normal loss and no abnormal gain, is debited to the abnormal gain account and the balance is credited to the costing profit and loss account. Cost per unit of output computed (as mentioned above) is used to value the output transferred to the next process.

Example 10.4

In a manufacturing unit, raw material passes through four processes, I, II, III and IV and the output of each process is the input of the subsequent process. The loss in the four processes I, II, III and IV are respectively 25%, 20%, 20% and 16.2/3% of the input. If the end product at the end of Process IV is 40,000 kg, what is the quantity of raw material required to be fed at the beginning of Process I and the cost of the same at Rs 5 per kg?

Find out also the effect of increase or decrease in the material cost of the end product for variation of every rupee in the cost of the raw material. *(B. Com. (Hons), Delhi 1998, CA Inter)*

Solution

	Input	Loss	Output
Process I	100	25	75
Process II	75	15	60
Process III	60	12	48
Process IV	48	8	40

In case the end product at the Process of IV is 40,000 kg, the quantity of raw material required to be fed at the beginning of Process I comes to:

$$40,000 \times 100/40 = 1,00,000 \text{ kg or } 2.50 \text{ kg for output of } 1 \text{ kg}$$

$$\text{Total cost of material} = \text{Rs } 5,00,000$$

For every rupee increase or decrease in the cost of raw material, the cost of the end product will increase or decrease by Rs 2.50 (i.e. $2.50 \times \text{Re } 1$)

This can be verified as follows:

$$\text{Present cost of raw material of } 1,00,000 \text{ kg @ Rs } 5 = \text{Rs } 5,00,000$$

$$\text{Cost of end product Rs } 5,00,000/40,000 = \text{Rs } 12.50 \text{ per kg}$$

Increase in cost

In case the raw material cost increases by Re 1 per kg

The total cost will be: Rs 6,00,000

New cost per kg of final product Rs 6,00,000/40,000 = Rs 15

Thus, on account of increase of Re 1 in the cost of raw material, the end product cost has gone up from Rs 12.50 per kg to Rs 15 per kg, i.e. an increase of Rs 2.50.

Decrease in cost

In case the raw material cost decreases by Re 1 per kg

The total cost will be Rs 4,00,000

New cost per kg of final product Rs $4,00,000/40,000 = \text{Rs } 10$

Thus, the final product cost has come down from Rs 12.50 to Rs 10 per kg, i.e. a decrease of Rs 2.50 per kg.

Example 10.5

The following data are available pertaining to a product after passing through two processes A and B:

Output transferred to process C from process B, 9120 units for Rs. 49,263

Expenses incurred in Process C:

Sundry materials	Rs	1,480
Direct labour	Rs	6,500
Direct expenses	Rs	1,605

The wastage of process C is sold at Re 1.00 per unit. The overhead charges were 168% of direct labour. The final product was sold at Rs 10.00 per unit fetching a profit of 20% on sales.

Find the percentage of wastage in process C and prepare Process C Account.

(B. Com. (Hons), Delhi 1999)

Solution

Let the total finished output be x units

Total Sales Rs $10x$

Wastage in units $(9,120 - x)$

Sales Value $1 \times (9,120 - x)$ or Rs $9,120 - x$

Profit Rs. $2x$

Total Sales	= Total Cost + Profit
$10x$	= $69,768 - (9,120 - x) + 2x$
$7x$	= $69,768 - 9,120$
x	= $60,648/7 = 8,664$ units
Wastage	= $9,120 - 8,664 = 456$ units
Percentage to Input	= $\frac{456}{9,120} \times 100 = 5\%$

Process X Account

Particulars	Units	Rs	Particulars	Units	Rs
To. Tr. from Process B	9,120	49,263	By Wastage	456	456
To Sundry Materials		1,480	By Tr. to Finished		
To Direct Labour		6,500	Goods Stock A/c	8,664	69,312
To Direct Expenses		1,605	(@ Rs 8 per unit)		
To Overheads		10,920			
	9,120	69,768		9,120	69,768

Example 10.6

In a certain process, material is mixed and cooked in batches of 1,000 lbs each. Cooking results in 10 per cent loss of weight of the mixture. Since the cooking requires considerable skill and constant watching, there is generally a further loss for spoilage which is not discovered until processing has been com-

pleted. Also, past experience shows that normally *two* batches out of every *ten* started in the process are spoiled in this way.

In a given month, the production records show:

- (i) Production started in the process—50 batches of 1,000 lbs each.
- (ii) Production completed and transferred to finished goods is 34,200 lbs.
- (iii) There is no inventory of work-in-process at the beginning or end of the month.

Costs recorded during the month amounted to Rs 45,000. Prepare the Process Account for the month and determine the cost per pound of finished product. (B. Com. (Hons), Delhi 2000)

Solution

Dr.		Process Account				Cr.	
Particulars	Quantity lbs	Amount Rs.	Particulars	Quantity lbs	Amount Rs		
To Inputs	50,000	45,000	By Normal Loss in weight				
			$\frac{50,000 \times 10}{100}$	5,000			—
			By Spoilage				
			$\frac{50 \times 2 \times 1000}{10}$	10,000			—
			By Abnormal Loss	800			1,029
			By Finished stock A/c	34,200			43,971
	50,000	45,000		50,000			45,000

Working Notes:

Calculation of Cost of Abnormal Loss

$$\text{Net Cost} = \text{Rs } 45,000$$

$$\text{Net Output (lbs } 50,000 - \text{ lbs } 15,000) = \text{lbs } 35,000$$

$$\text{Actual Output} = \text{lbs } 34,200$$

$$\text{Abnormal Loss} = (\text{lbs } 35,000 - \text{ lbs } 34,200) = \text{lbs } 800$$

$$\text{Cost of Abnormal Loss} = \frac{45,000 \times 800}{35,000} = \text{Rs. } 1,029$$

Example 10.7

The input to a purifying process was 16,000 kg of basic material purchases @ Rs 1.20 per kg. Process wages amounted to Rs 720 and overhead was applied @ 240% of the labour cost. Indirect materials of negligible weight were introduced into the process at a cost of Rs 336. The actual output from the process weighed 15,000 kg. The normal yield of the process is 92%. Any difference in weight between the input of basic material and output of purified material (product) is sold @ Re. 0.50 per kg.

The process is operated under a licence which provides for the payment of royalty @ Re. 0.15 per kg. of the purified material produced.

Prepare:

- (i) Purifying Process Account
- (ii) Normal Wastage Account
- (iii) Abnormal Wastage/Yield Account
- (iv) Royalty Payable Account

(CA Inter, May 1996)

Solution

(i) Purifying Process Account

Dr.				Cr.			
Particulars	Qty.	Rate per kg	Amount	Particulars	Qty.	Rate per kg	Amount
	kg	Rs	Rs		kg.	Rs	Rs
To Input	16,000	1.20	19,200	By Normal Wastage	1,280	0.50	640
To Wages			720	(1,60,000 × 8/100)			
To Overheads			1,728	By Purified	15,000	1.60	24,000
(Rs. 720 × 240/100)				Stock A/c			
To Indirect Material			336				
To Royalty payable on normal yield			2,208				
(14,720 kg × 0.15)							
To Abnormal Effectives A/c	280	1.60	448				
	<u>16,280</u>		<u>24,640</u>		<u>16,280</u>		<u>24,640</u>

(ii) Normal Wastage Account

Dr.				Cr.			
Particulars	Qty.	Rate per kg	Amount	Particulars	Qty.	Rate per kg	Amount
	kg.	Rs	Rs		kg.	Rs	Rs
To Purifying Process A/c	1,280	0.50	640	By Abnormal Effectives A/c	280	0.50	140
				By Sale Proceeds	1,000	0.50	500
	<u>1,280</u>		<u>640</u>		<u>1,280</u>		<u>640</u>

(iii) Abnormal Effectives Account

Dr.				Cr.			
Particulars	Qty.	Rate per kg	Amount	Particulars	Qty.	Rate per kg	Amount
	kg	Rs	Rs		kg	Rs	Rs
To Normal Wastage A/c	280	0.50	140	By Purifying Process A/c	280	1.60	448
To Royalty Payable (on abnormal yield)		0.15	42				
To Costing P&L A/c			266				
	<u>280</u>		<u>448</u>		<u>280</u>		<u>448</u>

(iv) Royalty Payable Account

Particulars	Qty.	Rate	Amount	Particulars	Qty.	Rate	Amount
	kg	per kg Rs	Rs		kg	per kg Rs	Rs
To Balance	15,000	0.15	2,250	By Purifying Process A/c	14,720	0.15	2,208
				By Abnormal Effectives A/c	280	0.15	42
	15,000		2,250		15,000		2,250

Example 10.8

The finished product of a manufacturing company passes through three processes, viz., I, II and III. The normal wastage in each process is 5%, 7% and 10% for the processes I, II and III respectively (calculated with reference to the number of units fed into each process). The scrap generated out of wastage has a sale value of 70 paise per unit, 80 paise per unit and Rupee 1 per unit in the process I, II and III respectively. The output of each process is transferred to the next process and the finished output emerges from the process III and transferred to stock. There was no stock of work-in-progress in any process in a particular month. The details of cost data for the month are given below:

Particulars	Processes		
	I	II	III
Materials used (Rs)	1,20,000	40,000	40,000
Direct Labour Cost (Rs)	80,000	60,000	60,000
Production Expenses (Rs)	40,000	40,000	28,000
Output in Units (actuals)	38,000	34,600	32,000

Process I was fed with 40,000 units of raw input at cost of Rs. 3,20,000.
Prepare the Process Accounts.

(ICWA Inter, June 1996)

Solution

Process I Account

Particulars	Units	Amount	Particulars	Units	Amount
	(Nos.)	Rs		(Nos.)	Rs
To Units introduced	40,000	3,20,000	By Normal Loss (5% @ 70 p. per unit)	2,000	1,400
To Materials used	—	1,20,000	By Transfer to Process II @ Rs. 14.70 per unit	38,000	5,58,600
To Direct Labour	—	80,000			
To Production Expenses	—	40,000			
	40,000	5,60,000		40,000	5,60,000

Process II Account

Particulars	Units (Nos.)	Amount Rs	Particulars	Units (Nos.)	Amount Rs
To Transfer from Process I A/c	38,000	5,58,600	By Normal Loss (7% @ 80 paise per unit)	2,660	2,128
To Materials used	—	40,000	By Abnormal Loss (WN 1)	740	14,584
To Direct Labour	—	60,000	By Transfer to Process III		
To Production Expenses	—	40,000	@ 19.7078	34,600	6,81,888
	38,000	6,98,600		38,000	6,98,600

Process III Account

Particulars	Units (Nos.)	Amount Rs	Particulars	Units (Nos.)	Amount Rs
To Transfer from Process II Account	34,600	6,81,888	By Normal Loss @ 10% at Re. 1 per unit	3,460	3,460
To Materials used	—	40,000	By Transfer to Finished Stock A/c @ 25.896	32,000	8,28,700
To Direct Labour	—	60,000	per unit)		
To Production Expenses	—	28,000			
To Abnormal Effectives A/c [@ Rs 25.8968 (WN 2)]	860	22,272			
	35,460	8,32,160		35,460	8,32,160

Working Notes:

1. Amount of Abnormal Loss in Process II

$$= \frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Abnormal Cost in units}$$

$$= \frac{6,98,600 - 2,128}{388,000 - 2,660} \times 740 = \text{Rs. } 14,584$$

2. Amount of Abnormal Effectives in Process III

$$= \frac{8,09,888 - 3,460}{34,600 - 3,460} \times 860 = \text{Rs } 22,272$$

Example 10.9

A product passes through three processes—P, Q, and R. The details of expenses incurred on the three processes during the year 1994 were as under:

Particulars	P	Q	R
Units issued	10,000		
Cost per unit	100		

Particulars	P	Q	R
Sundry Materials	Rs 10,000	15,000	5,000
Labour	Rs 30,000	80,000	65,000
Direct Expenses	Rs 6,000	18,150	27,200
Sale Price of output per unit	Rs 120	165	250

Management expenses during the year amounted to Rs 80,000 and selling expenses were Rs 50,000. Both these are not allocable to the processes.

Actual output of the three processes was as under:

Process P—9,300 units; Process Q—5,400 units; Process R—2,100 units.

Two-thirds of the output of process P and one half of the output of process Q was passed on to the next process and the balance was sold. The entire output of process R was sold.

The normal wastage of the three processes calculated on the input of every process was:

Process P—5 per cent; Process Q—15 per cent; Process R—20 per cent.

The wastage of Process P was sold at Rs 2 per unit, that of Process Q at Rs 5 per unit and that of Process R at Rs 10 per unit.

Prepare the three Process Accounts and a Statement of Income for 1994 showing fully the accounting treatment of Process Wastage.

(B. Com. (Hons), Delhi 1996)

Solution

Process P Account

Particulars	Unit	Rs	Particulars	Units	Rs
To Input	10,000	10,000,000	By Normal Wastage	500	1,000
To Sundry Materials		10,000	By Abnormal Wastage (WN 1)	200	22,000
To Labour		30,000	By Process P Stock A/c	9,300	10,23,000
To Direct Expenses		6,000	(@ Rs. 110 per unit)		
	10,000	10,46,000		10,000	10,46,000

Process P Stock Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process P A/c	9,300	10,23,000	By Sales (@ Rs 120)	3,100	3,72,000
To Profit		31,000	By Process Q	6,200	6,82,000
			(@ Rs 110 per unit)		
	9,300	10,54,000		9,300	10,54,000

Process Q Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process P Stock A/c	6,200	6,82,000	By Normal Wastage	930	4,650
To Materials		15,000	By Process Q Stock A/c	5,400	8,10,000
To Labour		80,000	(@ Rs 150 per unit)		
To Direct Expenses		18,150			
To Abnormal Effective A/c (WN 2)	130	19,500			
	6,330	8,14,650		6,330	8,14,650

Process Q Stock Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process Q A/c	5,400	8,10,000	By Sales	2,700	4,45,500
To Profit		40,500	(@ Rs 165 per unit)		
			By Process R	2,700	4,05,000
			(@ Rs 150 per unit)		
	5,400	8,50,500		5,400	8,50,500

Process R Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process Q Stock A/c	2,700	4,05,000	By Normal Wastage	540	5,400
To Sundry Materials		5,000	By Abnormal Wastage	60	13,800
To Labour		65,000	(WN 3)		
To Direct Expenses		27,200	By Finished Goods A/c	2,100	4,83,000
			(@ Rs 230 per unit)		
	2,700	5,02,200		2,700	5,02,200

Finished Goods Stock Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process R A/c	2,100	4,83,000	By Sales (@ Rs 250		
To Profit		42,000	per unit)	2,100	5,25,000
	2,100	5,25,000		2,100	5,25,000

Income Statement

	Rs	Rs
Profit From:		
Process P Stock A/c	31,000	
Process Q Stock A/c	40,500	
Finished Goods Stock A/c	42,000	1,13,500
Profit from Abnormal Effectives of Process Q		
Cost value	19,500	
Less Sale value of 130 units @ Rs 5 per unit actually realised	650	18,850
		1,32,350
Less		
Loss on account of Abnormal Wastage Process P cost	22,000	
Less Sale value of 200 unit @ Rs 10 per unit	400	21,600
Process R Cost	13,800	
Less sale value of 60 units @ Rs 10 per unit	600	13,200
		34,800
Gross profit		97,550
Less Management Expenses	80,000	
Selling Expenses	50,000	1,30,000
Net Loss		32,450

Working Notes:

1. Cost of Abnormal Wastage = $\frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Abnormal Wastage in units}$
 $= \frac{10,46,000 - 1,000}{950} \times 200 = \text{Rs } 22,000$
2. Cost of Abnormal Effectives = $\frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Effective in units}$
 $= \frac{7,95,150 - 4,650}{5,270} \times 130$
 $= \text{Rs } 19,500$
3. Cost of Abnormal Wastage = $\frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Wastage in units}$
 $= \frac{5,02,200 - 5,400}{2,700 - 540} \times 60 = \text{Rs } 13,800$

Example 10.10

The product manufactured by the Standard Chemicals Ltd. passes through three processes I, II and III. The following costs have been incurred for the month of September, 1996:

Details	Process I (Rs)	Process II (Rs)	Process III (Rs)
1. Material Consumed	40,000	7,500	5,000
2. Direct Wages	22,500	10,000	10,000
3. Direct Expenses	20,500	2,250	2,505
Total (Rs)	83,000	19,750	17,505
	(units)	(units)	(units)
4. Output	3,900	3,850	3,200
5. Finished Process Stock:			
(i) 01-9-1996	600	550	800
(ii) 30-9-1996	500	800	Nil
6. Stock Valuation on 01-9-1996 (Rs per unit)	24.50	31.00	37.00
7. Percentage of Wastage	2	5	10
8. Net Realisable Value of wastage per unit (Rs)	13.50	16.25	21.00

Four thousand units of raw materials were introduced in Process No. I at a cost of Rupees twenty thousand.

Stocks are valued and transferred to subsequent processes at weighted average cost. The percentage of wastage is computed on the number of units entering the process concerned.

Prepare (i) Process Accounts; (ii) Process Stock Accounts; (iii) Normal Wastage Accounts; (iv) Abnormal Wastage/Effectives Account. (B. Com. (Hons), Delhi 1997)

Solution:

Process I Account					
(i) & (ii)					
Particulars	Units	Rs	Particulars	Units	Rs
To Input	4,000	20,000	By Normal Wastage	80	1,080
To Materials		40,000	By Abnormal Wastage	20	520
To Direct Wages		22,500	By Process I Stock A/c	3,900	1,01,400
To Direct Expenses		20,500			
	<u>4,000</u>	<u>1,03,000</u>		<u>4,000</u>	<u>1,03,000</u>

Process I Stock Account					
Particulars	Units	Rs	Particulars	Units	Rs
To Balance b/d	600	14,700	By Process II A/c	4,000	1,03,200
(@ Rs 24.5 per unit)			By Balance c/d	500	12,900
To Process I A/c	3,900	1,01,400	(@ Rs 25.8 per unit)		
	<u>4,500</u>	<u>1,16,100</u>		<u>4,500</u>	<u>1,16,100</u>

Process II Account					
Particulars	Units	Rs	Particulars	Units	Rs
To Process I Stock A/c	4,000	1,03,200	By Normal Wastage	200	3,250
(@ Rs 25.8 per unit)			By Process Stock A/c	3,850	1,21,275
To Direct Material		7,500	(@ Rs 31.5 per unit)		
To Direct Wages		10,000			
To Direct Expenses		2,250			
To Abnormal Effectives A/c	50	1,575			
	<u>4,050</u>	<u>1,24,525</u>		<u>4,050</u>	<u>1,24,525</u>

Process II Stock Account					
Particulars	Units	Rs	Particulars	Units	Rs
To Balance b/d	550	17,050	By Process III A/c	3,600	1,13,175
(@ Rs 31 per unit)			By Balance c/d	800	25,150
To Process II A/c	3,850	1,21,275	(@ Rs 31.44 per unit)		
	<u>4,400</u>	<u>1,38,325</u>		<u>4,400</u>	<u>1,38,325</u>

Process III Account					
Particulars	Units	Rs	Particulars	Units	Rs
To Process II Stock A/c	3,600	1,13,175	By Normal Wastage A/c	360	7,560
To Materials		5,000	By Abnormal Wastage A/c	40	1,520
To Direct Wages		10,000	By Process III Stock A/c	3,200	1,21,600
To Direct Expenses		2,505			
	<u>3,600</u>	<u>1,30,680</u>		<u>3,600</u>	<u>1,30,680</u>

Process III Stock Account

Particulars	Units	Rs	Particulars	Units	Rs
To Balance b/d (@ Rs 37 per unit)	800	29,600	By Finished Goods Stock A/c	4,000	1,51,200
To process III A/c	3,200	1,21,600	(@ Rs 37.8 per unit)		
	4,000	1,51,200		4,000	1,51,200

(iii) Normal Wastage Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process I A/c	800	1,080	By Sale Proceeds:		
To Process II A/c	200	3,250	Process I	800	1,080
			Process II	150	2,438
			By Abnormal Effectives A/c	50	812
	1,000	4,330		1,000	4,330

(iv) Abnormal Wastage Account

Particulars	Units	Rs	Particulars	Units	Rs
To Process I A/c	20	520	By Sales Proceeds:		
To Process III A/c	40	1,520	Process I	20	270
			Process III	40	840
			By Costing P/L A/c		930
	60	2,040		60	2,040

Abnormal Effectives Account

Particulars	Units	Rs	Particulars	Units	Rs
To Normal Wastage A/c	50	812	By Process II A/c	50	1,575
To Costing P/L A/c		763			
	50	1,575		50	1,575

Working Notes:

$$\begin{aligned}
 1. \text{ Cost of Abnormal Wastage in Process } I &= \frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Wastage in Units} \\
 &= \frac{1,03,000 - 1,080}{3,920} \times 20 \\
 &= \frac{1,01,920}{3,920} \times 20 = \text{Rs } 520
 \end{aligned}$$

$$2. \text{ Cost of Abnormal Effectives in Process II } = \frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Effectives in Units}$$

$$= \frac{1,22,950 - 3,250}{3,800} \times 50$$

$$= \frac{1,19,700}{3,800} \times 50 = \text{Rs } 1,311$$

$$3. \text{ Cost of Abnormal Wastage in Process III} = \frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Wastage in units}$$

$$= \frac{1,30,680 - 7,560}{3,600 - 360} \times 40$$

$$= \frac{1,23,120}{3,240} \times 40 = \text{Rs } 1,520$$

Example 10.11

The following details have been extracted from the books of M/s Sunil Brothers (Pvt.) Ltd. having three workshops and a warehouse for the year 31st March, 2001.

	Workshop A	Workshop B	Workshop C
Raw Materials used (in tonnes)	250	152	145
Cost per tonne (in Rs)	12	8	5
Direct wages (in Rs)	8,580	2,025	1,056
Chargeable expenses (in Rs)	1,380	1,387	225
Loss of tonnage due to processing	4%	5%	2 $\frac{1}{2}$ %
Proportion of production transferred to:			
To Workshop B at cost	20%		
To Workshop C at cost		50%	
Proportion of production transferred to:			
Warehouse at cost	80%	50%	100%
Stock on 1st April 2000 at cost (ex-workshop—in Rs)	250	200	400
Stock on 31st March 2001 (ex-workshop—in tonnes)	10	20	40
Sales of products	Rs 40,000		
Salaries	4,000		
Administration expenses	2,000		

The closing stock in the wholesale warehouse is to be valued at the prime cost per tonne during the year.

You are required:

- to prepare workshop cost accounts for the year ended 31st March 2001,
- to calculate prime cost per tonne of each process, and
- to prepare an account showing the net profit of the business for the year ended 31st March, 2001.

(CS Inter)

Solution

Workshop 'A' Account

	Tonnes	Amount		Tonnes	Amount
To Raw materials	250	Rs 3,000	By Loss due to processing	10	—
To Direct wages		8,580	By Workshop B (transfer)		
To Direct expenses		1,380	@ Rs 54 per tonne	48	Rs 2,592
			By Warehouse (transfer)		
			@ Rs 54 per tonne	192	10,368
	<u>250</u>	<u>12,960</u>		<u>250</u>	<u>12,960</u>

Workshop 'B' Account

	Tonnes	Amount		Tonnes	Amount
To Raw materials	152	Rs 1,216	By Loss due to processing	10	—
To Transfer from Workshop A	48	2,592	By Workshop C (transferred @ Rs 38 per tonne)	95	3,610
To Direct wages		2,025	By Warehouse (transferred @ Rs 38 per tonne)	95	3,610
To Direct expenses		1,387			
	<u>200</u>	<u>7,220</u>		<u>200</u>	<u>7,220</u>

Workshop 'C' Account

	Tonnes	Amount		Tonnes	Amount
To Raw Materials	145	Rs 725	By Loss due to processing	6	—
To Transfer from Workshop B	95	3,610	By Transfer to warehouse (@ Rs 24 per tonne)	234	5,616
To Direct wages		1,056			
To Direct expenses		225			
	<u>240</u>	<u>5,616</u>		<u>240</u>	<u>5,616</u>

Profit and Loss Account for the year ended 31st March, 2001

	Amount		Amount
To Cost of goods sold:		Rs	By Sales
Workshop A:	Rs		Rs 40,000
Opening stock	250		
Add: Year's production	10,368		
	<u>10,618</u>		
Less: Closing stock			
10 units @ 54 per unit	540	10,078	
	<u>3,810</u>		
Workshop B:			
Opening stock	200		
Add: Year's production	3,610		
	<u>3,810</u>		

Less: Closing stock 20 units @ 38 per unit	760	3,050	
Workshop C:			
Opening stock	400		
Add: Year's production	5,616		
	<u>6,016</u>		
Less: Closing stock 40 units @ Rs 24 per unit	960	5,056	
		18,184	
To Gross profit c/d		21,816	
		<u>Rs 40,000</u>	<u>Rs 40,000</u>
To Salaries		4,000	By Gross Profit b/d
To Administration expenses		2,000	
To Net profit		15,816	
		<u>21,816</u>	<u>21,816</u>

Process Costing Having Work-in-Progress at Different Stages of Completion

When a process consists of opening and closing stock fully completed, the cost unit is obtained by dividing the total cost including the cost of opening stock by the number of units completed. This unit cost is used to price the output transferred to the next process and to value the units which remain in inventory. The following example illustrates this situation:

Process I					
	Units	Rs		Units	Rs
To Stock (opening)	2,000	3,500	By Transfer to	9,000	27,000
To Materials	10,000	20,050	second process		
To Wages		9,450	By Stock	3,000	9,000
To Overhead		3,000			
	<u>12,000</u>	<u>36,000</u>		<u>12,000</u>	<u>36,000</u>

$$\text{Unit cost} = \frac{\text{Rs } 36,000}{12,000 \text{ units}} = \text{Rs } 3 \text{ per unit}$$

The unit cost, Rs 3 per unit, has been used to price the goods transferred to the second process as well as to the stock.

Closing Work-in-Progress

In most situations, process may consist of partially completed closing units at the end of an accounting period. It is apparent that a partially completed unit must carry a cost that is lower than a finished unit. It follows that where there are inventories of closing work-in-progress, units costs cannot be computed

by simply dividing the total cost by the number of units processed. Units in work-in-process must be converted to a base that can be equated with finished production. This analysis is known as Equivalent Production Analysis.

Equivalent units are defined in I.C.M.A. Terminology of Management and Financial Accountancy as follows:

“Equivalent units are a notional quantity of completed units substituted for an actual quantity of incomplete physical units in progress, when the aggregate work content of the incomplete units is deemed to be equivalent to that of the substituted quantity. The principle applies when operations costs are being apportioned between work-in-progress and completed output.”

Equivalent Production Analysis

Before unit costs can be computed, closing inventories of work-in-progress must be converted into finished equivalents (also called equivalent production). This is done by multiplying the actual number of units in process by their stage of completion measured in terms of cost. Thus 2,000 units in an inventory estimated to be 50% complete are equal in cost to 1,000 units that have been completed:

$$\begin{aligned} \text{Actual number of units} \times \text{Stage of completion} &= \text{Finished equivalent} \\ 2,000 \times 50\% &= 1,000 \end{aligned}$$

The following four possibilities may exist with regard to work-in-progress or the question of equivalent production:

1. Closing work-in-progress without any process loss or gain.
2. Closing work-in-progress with process loss or gain.
3. Opening and closing work-in-progress with no process loss or gain.
4. Opening and closing work-in-progress along with process loss or gain.

Situation I (Only Closing Work-in-Progress)

In this case equivalent production is determined in the case of closing work-in-progress by applying percentages of completion for each element of cost. After computing equivalent production, the cost per unit of equivalent production is found and this cost per unit is used to value the finished output transferred to the second process and also closing work-in-progress units. It should be noted that the cost per unit (for each element of cost) is applied to equivalent production of work-in-progress units and not to work-in-progress units directly.

Examples 10.12 to 10.14 explain the preparation of process accounts in this situation.

Example 10.12

Prepare statement of equivalent production, statement of cost and process account from the following information:

Units introduced	7,600
Output (units)	6,000
Process cost (Rs):	
Material	14,560
Labour	21,360
Overhead	14,240

Degree of completion for closing work-in-progress

Material	80%
Labour	70%
Overhead	70%

Solution

Statement of Equivalent Production

Input	Output items	Equivalent Production						
		Units	Materials units	%	Labour units	%	Overhead units	%
Units introduced	1. Units completed and transferred	6,000	6,000	100	6,000	100	6,000	100
7,600	2. Work-in-progress	1,600	1,280	80	1,120	70	1,120	70
7,600		7,600	7,280		7,120		7,120	

Statement of Cost

Element cost	Cost (Rs)	Equivalent production	Cost per completed unit (Rs)
Material	14,560	7,280	2
Labour	21,360	7,120	3
Overhead	14,240	7,120	2
	50,160		7

Statement of Apportionment of Cost

Output transferred		6,000 × Rs 7 = 42,000
Work-in-progress:		
Material	1,280 × 2 = 2,560	
Labour	1,120 × 3 = 3,360	
Overhead	1,120 × 2 = 2,240	
		<u>8,160</u>
		50,160

Process Account

	Units	Amount		Units	Amount
To Materials	7,600	14,560	By Output transferred	6,000	42,000
To Labour		21,360	By Closing work-in-progress	1,600	8,160
To Overhead		14,240			
	<u>7,600</u>	<u>50,160</u>		<u>7,600</u>	<u>50,160</u>

Example 10.13

The product manufactured by a light engineering factory undergoes two operations. The following data are available relating to expenses incurred on production during November, 2001:—

	Machining	Finishing
Units as input	90,000	60,000
Expenses incurred in process :	Rs	Rs
Direct material	2,70,000	Nil
Direct labour	1,28,000	45,000
Overheads	64,000	1,35,000

At the end of the month there were 30,000 units lying incomplete in Machining Operation. While the full quantity of material has been consumed for the total production, the expenditure on Labour and Overheads was estimated to be 66-2/3% in respect of the incompleting products.

You are required to prepare a detailed Cost Statement showing the final cost per unit assuming:

- Completed units of Machining Operations are transferred to the Finishing Operation;
- Finishing Operation has completed all the units received from the earlier operation during November 2001 leaving no work-in-progress at the end of the month. (ICWA Inter)

Solution

Statement of Equivalent Production

Machining Operation:	Total units	Equivalent Units		
		DM	DL	OV
Completed units	60,000	60,000	60,000	60,000
Incompleted units	30,000	30,000	20,000	20,000
Total	90,000	90,000	80,000	80,000
Finishing operation : units				
Transfer from machining operation	60,000	60,000	60,000	60,000

(ii) Statement of Cost per Unit of Machining Operation

	DM	DL	Overheads
Costs incurred	2,70,000	1,28,000	64,000
Output	90,000	80,000	80,000
Cost per unit	3.00	1.60	.80

Statement of Total Cost

	Total
<i>Machining Operation Costs:</i>	
Direct material	2,70,000
Direct labour	1,28,000
Overheads	64,000
	4,62,000
Less: Closing stock (30,000 Units)	
DM 30,000 × 3 = 90,000	

DL 20,000 × 1.6	= 32,000	
OV 20,000 × .08	= 16,000	1,38,000
Cost of Finished Output from Machining Operation		3,24,000
Add: Finished operation costs:		
Direct Labour		45,000
Overheads		1,35,000
Total cost after finishing operation		5,04,000
Total output		Units 60,000
Cost per unit		Rs 8.40

Example 10.14

A manufacturing concern, engaged in mass production produces standardised electric motor in one of its departments. From the following particulars of a job of 50 motors, you are required to value the work-in-progress and finished goods.

- (a) Costs incurred as per job card:
- | | | | |
|-----------------|-----------|-----------|-----------|
| Direct material | Rs 75,000 | Overheads | Rs 60,000 |
| Direct labour | Rs 20,000 | | |
- (b) Selling price per motor: Rs 4,500
- (c) Selling and distribution expenses are at 30% of sales value.
- (d) 25 motors are completed and transferred to finished goods.
- (e) Completion stage of work-in-progress:
- | | | | |
|-----------------|------|----------------------------|-----|
| Direct Material | 100% | Direct Labour and Overhead | 60% |
|-----------------|------|----------------------------|-----|
- (ICWA Inter)*

Solution**Statement of Equivalent Production and Cost**

Particulars	Direct Material		Labour & Overhead		Total
	%	Qty	%	Qty	
Transferred to finished goods	100	25	100	25	
Work-in-progress	100	25	60	15	
Equivalent units		50		40	
Total cost (Rs)		75,000		80,000	1,55,000
Cost per equivalent unit (Rs)		1,500		2,000	3,500

Actual Cost of Production per Unit of Finished Goods

Direct material	Rs 1,500
Labour & overhead	Rs 2,000
Total	Rs 3,500

Market Value per Unit of Finished Goods

Selling price	Rs 4,500
---------------	----------

Less: Selling and distribution overheads @ 30% of Rs 4,500	Rs 1,350
	Rs 3,150

Stocks should be at the lower of the cost (i.e., Rs 3,500) or market value (i.e., Rs 3,150). Hence, basis of valuation will be market value in this case.

Value of Work-in-progress

Direct Material: Rs 1,500 × 25 units	= Rs 37,500
Labour & Overhead: Rs (3,150 – 1,500) × 15 units	= Rs 24,750
	Rs 62,250

Value of Finished Goods Stock

25 units × Rs 3,150	= Rs 78,750
Total Value of Inventory = Rs 78,750 + Rs 62,250	= Rs 1,41,000

Situation 2 (Closing work-in-Progress and Process Loss or Gain)

Process loss may occur (i) early in a process or during a process; or (ii) at the final stages of a process. The point of occurrence of normal losses (spoiled units) has an important bearing on deciding which of the following two approaches should be used in process accounting:

1. *First Approach*—Cost of normal loss units should be spread over the entire production, i.e., cost of normal loss units should be included in the cost of all units computed as equivalent production.

2. *Second Approach*—Cost of normal loss units should be included in the cost of all good units which have been completed and thus cost of normal loss units will not be charged to closing work-in-progress.

The first approach is followed when normal loss occurs at the beginning of or during a process. Since the normal loss occurs early in processing it applies to both completed production and units that are left in process; all work (production) done in that period should be charged with the normal loss. This is achieved by using a value of zero as the finished equivalent of the units lost, thus forcing the good unit that remains to absorb the cost of the bad units. The normal loss units are completely ignored, the cost per unit is increased. Costs for the period are divided by a smaller number of equivalent units, thereby increasing the cost per unit. Cost apportionment to units completed and units still in process is computed using the higher unit cost. Thus, normal spoilage costs are automatically spread over all the equivalent good units (units completed and units in process).

The second approach is followed when normal process loss occurs at the end of a process (e.g., loss discovered after final inspection). In this case, as mentioned above, cost of normal loss units is included in the cost of only completed units and not in closing work-in-progress units. If the lost units occur at the end of a process, they are usually regarded as belonging to the completed units and hence costs are charged to those units which have been finished. Since none of the units lost or spoiled (normal loss units) come from closing work-in-progress, no part of the cost of spoiled units should be charged to the units still in process; the cost of spoiled units must be absorbed by the good units completed. This is done by first treating the normal loss units as completed and charging them with the same cost that applies to good completed units. The cost charged to normal loss units is then added to the cost of the good completed units, thus excluding any of the cost of the normal loss units in cost of work-in-progress units.

In absence of specific information regarding occurrence of normal loss, it should be preferably assumed that normal loss has taken place during a process and not at the end of a process. Hence, in such a case, the first approach (as mentioned above) should be followed.

Examples 10.15 to 10.18 explain the above two approaches.

Example 10.15 (Normal Loss at Beginning of or during a Process)

AB Ltd. is engaged in the process engineering industry. During the month of April 2002, 2,000 units were introduced in Process X. The normal loss was estimated at 5% of input. At the end of the month 1,400 units had been produced and transferred to Process Y, 460 units were incomplete units and 140 units during the process had to be scrapped. The incomplete units had reached the following stage of completion:

Material	75%	Completed
Labour	50%	"
Overhead	50%	"

Following is further information in Process X:

	Rs
Cost of the 2,000 units	58,000
Additional direct material	14,400
Direct labour	33,400
Direct overhead	16,700
Units scrapped realised Rs 10 each	

Prepare a statement of equivalent production, statement of cost, statement of evaluation and the Process X account. (ICWA Inter)

Solution

Statement of Equivalent Production

Units output	Units	Equivalent Production					
		Materials		Labour		Overhead	
		Qty	% of completion	Qty	% of completion	Qty	% of completion
Normal loss	100	—	—	—	—	—	—
Abnormal loss	40	40	100	40	100	40	100
Completed and transferred to Process Y	1,400	1,400	100	1,400	100	1,400	100
Work-in-progress	460	345	75	230	50	230	50
	2,000	1,785		1,670		1,670	

Statement of Cost

Element of cost	Cost (Rs)	Equivalent	Cost per unit (Rs)
Materials: Unit introduced	58,000		
Direct	14,400		
	72,400		

Less: Scrap realisation	1,000		
	71,400	1,785	40
Direct labour	33,400	1,670	20
Overheads	16,700	1,670	10
Total:	1,21,500		70

Statement of Apportionment of Cost

Production	Element of cost	Equivalent production	Cost per unit (Rs)	Cost (Rs)	Total cost (Rs)
Abnormal loss	Material	40	40	1,600	2,800
	Labour	40	20	800	
	Overhead	40	10	400	
Finished production	Material	1,400	40	56,000	98,000
	Labour	1,400	20	28,000	
	Overhead	1,400	10	14,000	
Work-in-progress	Material	345	40	13,800	20,700
	Labour	230	20	4,600	
	Overhead	230	10	2,300	
					1,21,500

Process X Account

	Units	Rs		Units	Rs
Units introduced	2,000	58,000	Normal loss	100	1,000
Material		14,400	Abnormal loss	40	2,800
Labour		33,400	Transfer to		
Overheads		16,700	Process Y	1,400	98,000
			Balance c/d	460	20,700
	2,000	1,22,500		2,000	1,22,500

Example 10.16 (Normal Loss at the End of a Process)

The finished products of a factory pass through two processes, the entire material being placed in process at the beginning of the first process. From the following production and cost data relating to the first process, prepare a statement of equivalent production, statement of cost, and process account of spoilage of 1,000 kg occur at the end of the first process.

Process costs	Rs
Materials	60,000
Labour	33,600
Overhead	22,400
Units put into Process I	12,000
Transferred to Process II	10,000
Closing inventory (20% complete)	1,000

Solution

Statement of Equivalent Production

Inputs	Outputs	Equivalent Production						
		Units	Material		Labour		Overhead	
			Units	%	Units	%	Units	%
Units Introduced	1. Normal loss	1,000	1,000	100	1,000	100	1,000	100
12,000	2. Units completed & transferred	10,000	10,000	100	10,000	100	10,000	100
	3. Closing work-in-progress	1,000	1,000	100	200	20	200	20
12,000		12,000	12,000		11,200		11,200	

Statement of Cost

Element of cost	Cost Rs	Equivalent production units	Cost per unit Rs
Material	60,000	12,000	5.00
Labour	33,600	11,200	3.00
Overheads	22,400	11,200	2.00
	<u>1,16,000</u>		<u>10.00</u>

Statement of Cost Apportionment

(i) Completed units transferred to Process II	$10,000 \times 10 =$	Rs 1,00,000
Add: Cost of normal loss units	$1,000 \times 10 =$	10,000
		<u>1,10,000</u>
(ii) Work-in-progress		
Material	$1,000 \times 5 =$	5,000
Labour	$200 \times 3 =$	600
Overheads	$200 \times 2 =$	400
		<u>6,000</u>

Example 10.17 (Normal Loss during a Process)

A company within the food industry mixes powdered ingredients in two different processes to produce one product. The output of Process I becomes the input of Process II and the output of Process II is transferred to the packing department.

From the information given below, you are required to open accounts for Process I, Process II, abnormal loss and packing department and to record the transactions for the week ended 11th May 2002:

Process I:

Input

Material A

6,000 kilograms at 50 paise per kilogram

Material B	4,000 kilograms at Rupee 1 per kilogram
Mixing labour 430 hours at Rs 2 per hour	
Normal loss	5% of weight of input, disposed of at 16 paise per kilogram
Output	9,200 kilogram

No work-in-process at the beginning or end of the week.

Process II:

Input

Material C	6,600 kilograms at Rs 1.25 per kilogram
Material D	4,200 kilograms at Re 0.75 per kilogram
Flavouring essence	Rs 300
Mixing labour	370 hours at Rs 2 per hour
Normal waste	5% of weight of input with no disposal value
Output	18,000 kilograms

No work-in-process at the beginning of the week, but 1,000 kilograms is in process at the end of the week and estimated to be only 50% complete as far as labour and overhead were concerned.

Overhead of Rs 3,200 by the two processes to be absorbed on the basis of mixing labour hours.
(CA Inter)

Solution

Process I Account

<i>Particulars</i>	<i>kg</i>	<i>Rs</i>	<i>Particulars</i>	<i>kg</i>	<i>Rs</i>
To Material A	6,000	3,000	By Normal loss	500	80
To Material B	4,000	4,000	By abnormal loss	300	300
To Mixing labour (430 hours @ Rs 2.00 per hour)		860	(Working Note 2)		
			By Transfer to Process II @		
			Re 1 per kg	9,200	9,200
To Overhead (Working Note 1)		1,720			
	<u>10,000</u>	<u>9,580</u>		<u>10,000</u>	<u>9,580</u>

Process II Account

<i>Particulars</i>	<i>kg</i>	<i>Rs</i>	<i>Particulars</i>	<i>kg</i>	<i>Rs</i>
To Transfer from Process I @ Re 1 per kg	9,200	9,200	By Normal waste	1,000	—
To Material C	6,600	8,250	By Work-in-process	1,000	1,160
To Material D	4,200	3,150	(See Working Note 3)		
To Flavouring essence		300	By Packing deptt.	18,000	21,960
To Mixing labour (370 hours @ 2.00 per hour)		740	(@ Rs 1.22 per kg)		

Particulars	kg	Rs	Particulars	kg	Rs
To Overhead (Working Note 1)		1,480			
	20,000	23,120		20,000	23,120

Packing Department Account

Particulars	kg	Rs	Particulars	kg	Rs
To Process II A/c	18,000	21,960	By Balance of output @ Rs 1.22 per kg		21,960
		21,960			21,960

Abnormal Loss Account

Particulars	kg	Rs	Particulars	kg	Rs
To Process I A/c	300	300	By Sale proceeds	300	48
			By P & L A/c (Loss)		252
		300			300

Working Notes:

1. Total overheads: Rs 3,200

Total labour hours in Process I and II = 800

Overhead absorption rate = Rs 3,200/800 hours

= Rs 4 per labour hour

Overheads for Process I = 430 × Rs 4 = Rs 1,720

Overheads for Process II = 370 × Rs 4 = Rs 1,480

2. Cost of 9,500 kg of output is = (Rs 9,580 – Rs 80)
i.e. Rs 9,500

Hence cost per kg of output is Re 1.00

3. (a) Statement of Equivalent Production

Particulars	Units	Equivalent Units		
		Material	Labour	Overhead
Completed units	18,000	18,000	18,000	18,000
WIP (100% material, 50% labour and overhead)	1,000	1,000	500	500
Normal waste	1,000	—	—	—
	20,000	19,000	18,500	18,500

- (b) Cost Statement for Process II for the week ending 11th May, 2002

	Rs
Material (Transfer from Process I)	9,200
Material C	8,250
Material D	3,150
Flavouring essence	300
Total material cost	20,900
Total mixing labour cost	740
Total overhead cost	1,480
 (c) Statement of Cost per Equivalent Unit	
Material	= Rs 20,900/19,000 = Rs 1.10
Labour	= Rs 740/18,500 = Re 0.40
Overhead	= Rs 1,840/18,500 = Re 0.08
 (d) Statement of Cost of Work-in-Progress	
Material	= 1,000 × Rs 1.10 = Rs 1,100
Labour	= 500 × Re 0.04 = Rs 20
Overhead	= 500 × Re 0.08 = Rs 40
	1,160

Example 10.18 (Normal Loss during a Process)

R.P. Ltd. furnishes you the following information relating to Process B for the month of October 2001.

- (i) Opening work-in-progress—NIL
- (ii) Units introduced—10,000 units @ Rs 3 per unit.
- (iii) Expenses debited to the process:

Direct materials	Rs 14,650
Labour	Rs 21,148
Overheads	Rs 42,000
- (iv) Normal loss in process—One per cent of input.
- (v) Closing work-in-progress—350 units—Degree of completion

Material	100%
Labour and overheads	50%
- (vi) Finished output 9,500 units
- (vii) Degree of completion of abnormal loss:

Material	100%
Labour and overheads	80%
- (viii) Units scrapped as normal loss were sold at Re 1 per unit.
- (ix) All the units of abnormal loss were sold at Rs 2.50 per unit.

Prepare:

1. Statement of Equivalent production;
2. Statement of cost of finished goods, Abnormal loss and Closing work-in-progress.

(ICWA Inter)

Solution

1. Statement of Equivalent Production (Process B)

	Equivalent Production						
	Total units	Material unit	Completion %	Labour units	Completion %	Over-heads	Completion %
Finished output	9,500	9,500	100	9,500	100	9,500	100
Normal loss 1% of input of 10,000	100	—	—	—	—	—	—
Abnormal loss (balancing fig.)	50	50	100	40	80	40	80
Closing work-in-progress	350	350	100	175	50	175	50
	<u>10,000</u>	<u>9,900</u>		<u>9,715</u>		<u>9,715</u>	

Statement of Cost per Equivalent Unit

	Material	Labour	Overhead
Units introduced $10,000 \times 3$	30,000	—	—
Add: Direct material	14,650		
	<u>44,650</u>		
Less: Sale of normal scrap 100×1	100		
	<u>44,550</u>	21,148	42,000
Cost per equivalent unit of production	Rs 44,550	Rs 21,148	Rs 42,000
	<u>9,900</u>	<u>9,715</u>	<u>9,715</u>
	= Rs 4.50	= Rs 2.18	= Rs 4.32
Total cost per unit of production	= (4.50 + 2.18 + 4.32) = Rs 11.00		

2. Statement of Cost

Finished goods	= $9,500 \times 11$			1,04,500
Abnormal loss:				
Material	= 50×4.50	=	225.0	
Labour	= 40×2.18	=	87.2	
Overheads	= 40×4.32	=	172.8	485
Closing WIP:				
Material	= 350×4.50	=	1,575	
Labour	= 175×2.18	=	382	
Overhead	= 175×4.32	=	756	2,713
		Total		<u>1,07,698</u>

3. Process B Account

	Units	Amount (Rs)		Units	Amount (Rs)
The Opening WIP	Nil	Nil	By Normal loss	100	100
To Units introduced	10,000	30,000	By Abnormal loss	50	485
To Direct materials		14,650	By Finished output (Rs 11 per unit)	9,500	1,04,500
To Labour		21,148	By Closing WIP c/d	350	2,713
To Overheads		42,000			
	<u>10,000</u>	<u>1,07,798</u>		<u>10,000</u>	<u>1,07,798</u>
To Material	12,000	60,000	By Spoilage	1,000	—
To Labour		33,600	By Output transferred	10,000	1,10,000
To Overhead		22,400	By Closing work-in-progress	1,000	6,000
	<u>12,000</u>	<u>1,16,000</u>		<u>12,000</u>	<u>1,16,000</u>

Note: As entire material is placed in the process at the beginning of the first process, it has been assumed that closing work-in-progress is complete 100% with regard to materials. Therefore, percentage of completion of 20% has been applied only in case of labour and overhead.

Situation 3 (Opening and Closing Work-in-progress without Process Loss or Gains)

A process account may have opening work-in-progress as well as closing work-in-progress. The treatment of closing work-in-progress is the same with regard to equivalent production and determining its cost. In case of opening work-in-progress, the production or finished units completed during the period will comprise two lots: (i) the first lot will be of opening work-in-progress which is partially incomplete and which will be completed during the period; (ii) the second lot of production will be of those units which are introduced into the process during the current period and have been completed during the period.

Since costs tend to vary from period to period, each lot may carry different units costs. The procedure of calculating equivalent production for opening work-in-progress units depends on which method of costing (cost flow assumption) has been used. If standard costing is not used, a method of costing can be selected from the following widely used methods:

1. First-in, First-out (FIFO)
2. Weighted Average Costing
3. Last-in, First-out (LIFO)

FIFO The FIFO method of costing is based on the assumption that opening work-in-progress units are the first to be completed, the first costs incurred in the period should be attached to units in opening work-in-progress. After opening work-in-progress units have been completed, new units are taken up during the current period. Equivalent production of opening work-in-progress can be calculated as follows:

Equivalent production = Units in opening W.I.P × Percentage of work needed to finish the units
Costs associated with the opening inventory in process are separated from costs of units started and

completed during the period, and the costs of the two periods are not combined before final transfer of completed units out of process. No unit of opening work-in-progress is automatically found in closing work-in-progress.

Weighted Average Costing Under average costing, opening work-in-progress units and costs both are combined with new production started in current period (both unit and cost) and weighted average cost per unit is determined by dividing the total cost (opening work-in-progress cost + current cost) by equivalent production. Costs attached with the opening inventory lose their identity because of this merger. The opening inventory cost is treated as if it were current period cost. No distinction is made between completed units from opening inventory and completed units from the new production. In fact, all units finished during the current accounting period are treated as if they were started and finished during that period. Therefore, equivalent, production (of opening work-in-progress) will be all units of opening work-in-progress. There is only one final unit cost for all completed units—a weighted average unit cost.

FIFO and average costing, although based on different costing concepts, do not necessarily produce significantly different unit costs. The differences in unit costs between the two costing methods may exist only under the following conditions:

1. Opening work-in-progress units are large, relative to the number of units started during the current period. The lesser number of units in opening inventory will have little influence on the average cost.
2. The stage of completion of the opening work-in-progress units is quite advanced. In absence of this, previous period costs of opening inventory will not have any impact on the average cost.
3. Previous period costs are substantially different from current period costs.

Average costing under normal conditions (if the above conditions do not exist) is the most appropriate, accurate and simple. However, if the above conditions prevail, the average cost may not be helpful in efficiency measurement and cost control.

LIFO In LIFO method the assumption is that the units entering into the process in the last are the first to be completed. This method influences differently the costs of complete units and the closing work-in-progress. The cost of opening work-in-progress is charged to the closing work-in-progress and thus the closing work-in-progress appears at the cost of opening work-in-progress. The completed units appear at their current costs.

Examples 10.19 to 10.23 present FIFO, Average Costing and LIFO methods in process accounts.

Example 10.19 (FIFO)

The accountant of a chemical company provides you the following data:

	Units	Amount (Rs)
Work-in-process, beginning of period	2,000	
Direct materials		4,200
Direct labour and manufacturing overhead		1,950
Addition to work-in-process in April	4,000	
Direct materials		9,000
		Direct labour and manufacturing overhead
		7,500
Total		<u>22,650</u>
Work-in-process, end of period	1,500	

Further, work-in-process at the beginning of the period is complete to the extent: materials 100% and labour and manufacturing overhead 75%. Work-in-process at the end of the period is complete to the extent: materials 100% and direct labour and manufacturing overhead only 50%.

You are required to:

- (i) Calculate the number of units of product transferred to finished-goods stock during the period. Assume no units are lost in process.
- (ii) Calculate the number of equivalent whole units of work completed during the period.
- (iii) Calculate the unit cost for materials during the month of April using First-in, First-out method of inventory issue.

(B. Com. (Hons), Delhi)

(i) Number of Units of Product Transferred to Finished Goods Stock

	Units
Opening work-in-process	2,000
Add: Units introduced in April	4,000
	6,000
Less: Closing work-in-process	1,500
Number of units transferred	4,500

(ii) Statement of Equivalent Production (FIFO Method)

	Units	Materials		Labour & Overheads	
		Degree of completion	Equivalent units	Degree of completion	Equivalent units
Opening work-in-progress (completed now)	2,000	—	—	25	500
Units introduced & completed	2,500	100	2,500	100	2,500
Units introduced but incomplete	1,500	100	1,500	50	750
	6,000		4,000		3,750

(iii) Statement of Unit Cost of Materials

Cost of materials incurred during the period	Rs 9,000
Equivalent production	4,000 units
Cost per unit Rs 9,000/4,000	Rs 2.25

Example 10.20 (Average Costing)

Prepare a statement of equivalent production, statement of cost, process account from the following information using the average method:

Opening Stock	20,000 units
Material	Rs 10,000
Labour	Rs 4,000
Overhead	Rs 5,000
Units Introduced	Rs 80,000 units
Material	Rs 40,000

Wages	Rs 31,000
Overhead	Rs 30,000

During the period 60,000 units were completed and transferred to Process II.
Closing stock 40,000 units, degree of completion.

Material	100%
Wages and overhead	25%

Solution

Statement of Equivalent Production

Inputs	Output	Equivalent Production			
		Material		Labour & Overhead	
		Units	%	Units	%
Opening (20,000 units)	1. Opening W.I.P. (20,000 units)	20,000	100	20,000	100
Introduced (80,000 units)	2. Units completed (40,000 units)	40,000	100	40,000	100
	3. Closing W.I.P. (40,000 units)	40,000	100	10,000	25
1,00,000	1,00,000	1,00,000		70,000	

Statement of Cost

Elements	Opening cost (Rs)	Current cost (Rs)	Total cost Rs	Equivalent production	Cost per unit
Material	10,000	40,000	50,000	1,00,000	0.50
Labour	4,000	31,000	35,000	70,000	0.50
Overhead	5,000	30,000	35,000	70,000	0.50
	19,000	1,01,000	1,20,000		1.50

Statement of Apportionment of Cost

- (i) Units completed and transferred $60,000 \times 1.50 =$ Rs 90,000
 (ii) Closing work-in-progress:
- | | | |
|------------|-------------------------------|----------|
| Material | $40,000 \times 0.50 = 20,000$ | |
| Labour | $10,000 \times 0.50 = 5,000$ | |
| Overhead | $10,000 \times 0.50 = 5,000$ | 30,000 |
| Total cost | | 1,20,000 |

Process Account

	Units	Amount		Units	Amount
To Opening stock	20,000	19,000	By Units completed and transferred	60,000	90,000
To Materials	80,000	40,000			
To Labour		31,000	By Closing W.I.P.	40,000	30,000
To Overhead		30,000			
	1,00,000	1,20,000		1,00,000	1,20,000

Example 10.21 (LIFO)

From the following information prepare: (a) Statement of equivalent production (b) Statement of cost for each element (c) Statement of apportionment of cost and (d) Process account for Process A using the LIFO method of inventory costing for the month of December 2001.

Units in process, Dec. 2001 (All material used, 50% completed regarding labour and overhead)	10,000
New units introduced	20,000
Total units	<u>30,000</u>

Production report reveals the following information:

Units completed	15,000
Units in process on December 31, 2001 (All material used, 50% complete regarding labour and overhead)	15,000
Loss in process	Nil

Cost Record

Work-in-process as on December 1, 2001	Rs
Material	3,600
Labour	3,900
Overhead	3,900
Cost for December, 2001	
Material	14,400
Labour	31,150
Overhead	31,150
Total Cost	<u>88,100</u>

Solution

Process A (LIFO Method)
Statement of Equivalent Production

Input		Output		Equivalent Production					
Particulars	Units	Particulars	Units	Material		Labour		Overhead	
				Units	%	Units	%	Units	%
Opening stock	10,000	Unit completed	15,000	15,000	100	15,000	100	15,000	100
New units introduced	20,000	Closing inventory (a) work on O/WIP (b) New units	10,000* 5,000	— 5,000	— 100	— 2,500	— 50	— 2,500	— 50
	<u>30,000</u>		<u>30,000</u>	<u>20,000</u>		<u>17,500</u>		<u>17,500</u>	

*No work has been done on units which represented opening work-in-process.

Statement of Cost of Each Element

<i>Elements of cost</i>	<i>Cost in process Rs</i>	<i>Equivalent production Units</i>	<i>Cost per unit Rs</i>
Material	14,400	20,000	0.72
Labour	31,150	17,500	1.78
Overhead	31,150	17,500	1.78
	76,700		

Statement of Apportionment of Cost

<i>Item</i>	<i>Elements</i>	<i>Equivalent production Units</i>	<i>Cost per unit Rs</i>	<i>Cost Rs</i>	<i>Total Rs</i>
Units completed	Material	15,000	0.72	10,800	64,200
	Labour	15,000	1.78	26,700	
	Overhead	15,000	1.78	26,700	
<i>Closing inventory Opening WIP</i>	Material	—	0.72	—	
	Labour	—	1.78	—	
	Overhead	—	1.78	—	
New units	Material	5,000	0.72	3,600	12,500
	Labour	2,500	1.78	4,450	
	Overhead	2,500	1.78	4,450	
					76,700

Process A Account

<i>Particulars</i>	<i>Units</i>	<i>Amount Rs</i>	<i>Particulars</i>	<i>Units</i>	<i>Amount Rs</i>
To Opening WIP	10,000	11,400	By Units completed	15,000	64,200
Units introduced	20,000		By Closing stock	15,000	23,900
Material		14,400			
Labour		31,150			
Overhead		31,150			
	30,000	88,100		30,000	88,100

Note: Process A/c has been credited with an amount of Rs 23,900 being the cost of closing stock, determined as follows:

Costs of opening WIP:

Material

Labour

Overhead

Rs

3,600

3,900

3,900

11,400

Add: Cost of work done on opening WIP

Nil

Add: Costs of newly introduced units

12,500

23,900

Example 10.22 (FIFO)

Vinal Ltd. produces Article B from a material which passes through two processes namely P and Q. The details relating to a month are as under:

	<i>Process P</i>	<i>Process Q</i>
Materials introduced (units)	10,000	
Transferred to next process (units)	9,000	
Work-in-progress:		
At the beginning of the month (units)	—	600
At the end of the month (units)	1,000	400
Expenses:		
Work-in-process at the beginning of the month	—	9,400
Materials introduced at the beginning of the process	1,20,000	
Labour and overheads	27,600	18,200

Stage of completion of work-in-process:

Process P: Closing W.I.P. 20% complete in respect of labour and overheads.

Process Q: Opening W.I.P. 33 1/3% complete in respect of labour and overheads.
Closing W.I.P. 25% complete in respect of labour and overheads.

The finished output B emerging out of Process Q is sold at Rs 20 per unit.

The management is considering an alternative by which the finished output B could be further treated by installing a new machine at a capital cost of Rs 8 lakhs. In such an event, the final product known as article N produced by this operation could be sold at Rs 25 per unit. The operating expenses of the aforesaid further treatment are estimated at Rs 23,000. The company desires a return on investment of 25%.

Required:

- Prepare the process cost accounts for Process P and Q.
(Show the working of equivalent units and cost per equivalent unit in each process).
- Prepare a statement of profitability of Product B as it emerges from Process Q.
- Advise the management whether further treatment of Product B by installing the new machine should be taken up or not.

(ICWA Inter)

Solution

(a) Process Cost Accounts

Equivalent Units—Process P

<i>Input units</i>	<i>Materials</i>		<i>Labour & Overhead</i>	
	<i>Units</i>	<i>Completion (%)</i>	<i>Units</i>	<i>Completion (%)</i>
9,000 Units completed	9,000	100	9,000	100
1,000 Closing stock	1,000	100	200	20
Equivalent units	10,000		9,200	
Expenses	Rs 1,20,000		Rs 27,600	
Cost per equivalent unit Rs	12		Rs 3	

Cost of closing stock = $1,000 \times \text{Rs } 12 + 200 \times \text{Rs } 3 = \text{Rs } 12,600$

Cost of completed units = $\text{Rs } 1,20,000 + \text{Rs } 27,600 - \text{Rs } 12,600 - \text{Rs } 1,35,000$

Equivalent Units—Process Q

Input		Materials		Labour & Overhead	
		Units	Completion (%)	Units	Completion (%)
600	Opening stock (work completed in current period)	—		400	66 2/3
8,600	Units completed (units started less closing stock; $9,000 - 400$)	8,600	100	8,600	100
400	Closing stock (work done in current period)	400	100	100	25
	Equivalent units	9,000		9,100	
	Expenses	Rs 1,35,000		Rs 18,200	
	Cost per equivalent unit	Rs 15		Rs 2	

Cost of closing stock = $400 \times \text{Rs } 15 + 100 \times \text{Rs } 2 = \text{Rs } 6,200$

Cost of finished stock (Product B) = $\text{Rs } 9,400 + \text{Rs } 1,35,000 + \text{Rs } 18,200 - \text{Rs } 6,200 = \text{Rs } 1,56,400$

Process P Account

	Units	Rs		Units	Rs
To Materials	10,000	1,20,000	By Transfer to Process Q	9,000	1,35,000
To Labour and overhead		27,600	By Closing stock	1,000	12,600
	10,000	1,47,600		10,000	1,47,600

Process Q Account

	Units	Rs		Units	Rs
To Opening stock	600	9,400	By Transfer to finished stock (Product B)	9,200	1,56,400
To Process P	9,000	1,35,000	By closing stock	400	6,200
To Labour and overhead		18,200		9,600	1,62,600
	9,600	1,62,600			

(b) Profitability of Product B

Sales (9,200 units at Rs 20 per unit)

Cost of production

Profit per month

Rs 1,84,000

Rs 1,56,400

Rs 27,600

(Cont.)

	Units	Rs	Units	Rs
(c) Further Processing of Product B to Final Product N				
Sales (9,200 units of N @ Rs 25)				Rs 2,30,000
Cost of Production:				
Upto Product B stage			Rs 1,56,400	
Further processing			Rs 23,000	Rs 1,79,400
Profit per month				Rs 50,600
Profit without further processing				Rs 27,600
Additional profit by further processing				Rs 23,000 per month
Desired return on fresh investment	= 25% on Rs 8,00,000			
	= 2,00,000 per year			
	= Rs 16,667 per month			

Further processing results in:

Additional profit per month of Rs 23,000 which works out to a return of $34.5\% \left(\frac{23,000 \times 12 \times 100}{8,00,000} \right)$

on investment as against the desired return of 25%.

Therefore, subject to the consideration of other non-cost factor, if any, the proposal for further processing is recommended for acceptance.

Example 10.23 (Average Costing)

Following information is available regarding process A for the month of February, 1999:

Production Record

Units in process as on 1.2.1999	4,000
(All materials used, 25% complete for labour and overhead)	
New units introduced	16,000
Units completed	14,000
Units in process as on 28.2.1999	6,000
(All materials used, $33 \frac{1}{3}\%$ complete for labour and overhead)	

Cost Records

Work-in-process as on 1.2.1999	Rs
Materials	6,000
Labour	1,000
Overhead	1,000
Cost during the month	8,000
Materials	25,600
Labour	15,000
Overhead	15,000
	<u>55,600</u>

Presuming that average method of inventory is used, prepare:

- (i) Statement of equivalent production.
- (ii) Statement showing cost for each element.
- (iii) Statement of apportionment of cost.
- (iv) Process cost account for process A.

(CA Inter, May 1999)

Solution

(i) Statement of Equivalent Production
(Average Cost Method)

Particulars		Materials			Labour		Overhead	
Input (units)	Output	Units	% com- pletion	Equi- valent units	% com- pletion	Equi- valent units	% com- pletion	Equi- valent units
20,000	Completed	14,000	100	14,000	100	14,000	100	14,000
	WIP	6,000	100	6,000	$33\frac{1}{3}$	2,000	$33\frac{1}{3}$	2,000
20,000		20,000		20,000		16,000		16,000

(ii) Statement of Cost

Particulars	Materials	Labour	Overhead	Total
Cost of Opening Work-in-progress (Rs)	6,000	1,000	1,000	8,000
Cost incurred during the month (Rs)	25,600	15,000	15,000	55,600
Total Cost (Rs.): (i)	31,600	16,000	16,000	63,600
Equivalent units: (ii)	20,000	16,000	16,000	
Cost per equivalent unit (Rs)	1.58	1	1	3.58
(iii) = (i)/(ii)				

(iii) Statement of Cost Apportionment

			Rs	Rs
Cost of output transferred: (i)	14,000 units @	Rs 3.58		50,120
Cost of closing work-in-progress: (ii)				
Materials	6,000 units @	Rs 1.58	9,480	
Labour	2,000 units @	Re 1	2,000	
Overhead	2,000 units @	Re 1	2,000	13,480
Total Cost: (i) + (ii)				63,600

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(iv) Process A Account

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Particulars	Units	Rs	Particulars	Units	Rs
To Opening WIP	4,000	8,000	By Completed units	14,000	50,120
To Materials	16,000	25,600	By Closing WIP	6,000	13,480
To Labour		15,000			
To Overhead		15,000			
	20,000	63,600		20,000	63,600

Situation 4 (Opening and Closing Work-in-progress with Process Losses or Gains)

In this situation, due adjustments are made for normal loss, abnormal loss, and abnormal gain in calculation of equivalent production. However, there is no change in the treatment of normal loss, abnormal loss and abnormal gain. Normal spoilage cost is borne by the good units produced; proceeds realised from the sale of normal loss scrap are credited to the relevant process account. These proceeds (sale of scrap) are also taken into account while calculating cost per unit of equivalent production. Abnormal loss units are valued like good units.

Examples 10.24 to 10.28 display the preparation of Process Accounts in this situation.

Example 10.24

The in process inventory in Process No. 2 at the beginning of a period was valued at Rs 2,950 made up of Rs 1,400 towards materials, Rs 1,000 towards labour and Rs 550 towards overheads for 100 units. The value added during the period was Rs 53,600 towards an introduction of 4,100 units from the previous process besides Rs 40,800 towards labour and Rs 19,400 towards overheads. Out of 3,600 units completed, 3,300 units were transferred to the next process leaving the balance in stock. 400 units were held back in process with half completion towards labour and overheads while 200 units were loss in processing considered normal and hence should be borne by the entire inventory. Prepare a cost of production statement using average cost basis.

(ICWA Inter)

Solution

Statement of Equipment Production

	Total units	Materials	Labour	Overheads
Completed units (including 300 held in stock)	3,600	3,600	3,600	3,600
Closing WIP	400	400	200	200
Normal loss	200	—	—	—
	<u>4,200</u>	<u>4,000</u>	<u>3,800</u>	<u>3,800</u>

Statement of Cost Per Equivalent Unit

	Materials	Labour	Overheads
	Rs	Rs	Rs
Opening WIP	1,400	1,000	550
Cost of units introduced	<u>53,600</u>	<u>40,800</u>	<u>19,400</u>
	<u>55,000</u>	<u>41,800</u>	<u>19,950</u>
Output (units)	4,000	3,800	3,800
Cost per unit (Rs)	13.75	11.00	5.25

Cost of Production Statement

Cost of unit transferred:	Rs
3,300 × (13.75 + 11 + 5.25)	99,000
Cost of units held in stock:	

	$300 \times (13.75 + 11 + 5.25)$	9,000
Cost of WIP:		
Material	400×13.75	= 5,500
Labour	200×11.00	= 2,200
Overheads	200×5.25	= 1,050
		8,750
		1,16,750

Example 10.25

The following data relate to Process Q:

- (i) Opening work-in-process 4,000 units
Degree of completion:
- | | | | |
|-----------|------|----|--------|
| Materials | 100% | Rs | 24,000 |
| Labour | 60% | Rs | 14,400 |
| Overheads | 60% | Rs | 7,200 |
- (ii) Received during the month of April, 1998 from Process P
40,000 units Rs 1,71,000
- (iii) Expenses incurred in Process Q during the month
- | | | | |
|-----------|--|----|----------|
| Materials | | Rs | 79,000 |
| Labour | | Rs | 1,38,230 |
| Overheads | | Rs | 69,120 |
- (iv) Closing work-in-process: 3,000 units
Degree of completion:
- | | | | |
|--------------------|------|--|--|
| Materials | 100% | | |
| Labour & Overheads | 50% | | |
- (v) Units scrapped 4,000 units
Degree of completion:
- | | | | |
|----------------------|------|--|--|
| Materials | 100% | | |
| Labour and Overheads | 80% | | |
- (vi) Normal loss: 5% of current input
(vii) Spoiled goods realised Rs 1.50 each on sale.
(viii) Completed units are transferred to warehouse.

Required: Prepare:

- (i) Equivalent units statement.
- (ii) Statement of cost per equivalent unit and total costs.
- (iii) Process Q Account.
- (iv) Any other account necessary.

(CA Inter, May 1998)

Solution

(i) Statement of Equivalent Production

Input Units	Particulars	Output Units	Equivalent Production					
			Materials		Labour		Overheads	
			% Completion	Units	% Completion	Units	% Completion	Units
4,000	Opening work-in-progress (units, Completed and transferred to warehouse)	4,000	—	—	40	1,600	40	1,600
40,000	Units completed and transferred to warehouse	33,000	100	33,000	100	33,000	100	33,000
	Closing work-in-progress	3,000	100	3,000	50	1,500	50	1,500
	Normal Loss	2,000	—	—	—	—	—	—
	Abnormal loss	2,000	100	2,000	80	1,600	80	1,600
				38,000		37,700		37,700

(ii) Statement of Cost Per Equivalent Unit and Total Cost

Particulars	Material I (Process P)	Material II (Process Q)	Labour & Overhead (Process Q)
Cost (Rs)	1,71,000	79,000	2,07,350
Less: Recovery from sale of scrapped 2,000 units at Rs 1.50 per unit being normal loss	—	3,000	—
	1,71,000	76,000	2,07,350
Equivalent Production	38,000	38,000	37,700
Cost per unit	Rs 4.5	Rs 2	Rs 5.50
Cost of Completed Units:			
Opening Stock 4,000 units			45,600
Costs incurred to complete Opening Stock into finished products (1,600 × 5.50)			8,800
			54,400
Cost of 33,000 completed units (33,000 units × Rs 12)			3,96,000
Total Cost of 37,000 completed units			4,50,400
Cost of Closing WIP 3,000 units (3,000 units × Rs. 6.50) + (1,500 units × Rs 5.50)			27,750
Cost of 2,000 Abnormal Loss units (2,000 units × Rs 6.50) + (1,600 units × Rs 5.50)			21,800
			4,99,950

(iii) Process Q Account

Particulars	Units	Rs	Particulars	Units	Rs
To Opening Work in Progress	4,000	45,600	By Normal Loss	2,000	3,000
To Units received	40,000	1,71,000	By Completed Units (transferred to warehouse)	37,000	4,50,400
To Costs Incurred:			By Closing Work in Progress	3,000	27,750
Materials		79,000	By Abnormal Loss	2,000	21,800
Labour		1,38,230			
Overheads		69,120			
	<u>44,000</u>	<u>5,02,950</u>		<u>44,000</u>	<u>5,02,950</u>

(iv) Abnormal Loss Account

Particulars	Units	Rs	particulars	Units	Rs
To Process Q Account	2,000	21,800	By Sale Proceeds	2,000	3,000
			By Profit & Loss Account (Loss)		18,800
		<u>21,800</u>			<u>21,800</u>

Example 10.26

Roy and Johnson (P) Ltd. gives the following particulars relating to process A in its plant for the month of December 1997:

Work-in-progress (opening balance) on 1.12.1997—500 units:	Cost	Rs
	Material	4,800
	Labour	3,200
	Overheads	6,400
		<u>14,400</u>
Units introduced during the month	19,500	
Processing costs incurred during the month:		
Materials	Rs	1,86,200
Labour		72,000
Overheads		1,06,400
		<u>Rs 3,64,600</u>
Output: Units transferred to process B		18,200
Units scrapped (completely processed)		1,400
Work-in-process (closing balance)		400
[Degree of completion: Materials 100% Labour and overhead 50%]		

Normal loss in processing is 5% of total input and normal scrapped units fetch Re. 1 each.

Prepare the following statements for process A for December 1997:

- Statement of Equivalent Production;
- Statement of Cost;

- (c) Statement of Evaluation;
 (d) Process A Account.

(ICWA Inter, June 1998)

Solution

Statement of Equivalent Production

Input (Units)	Particulars	Equivalent Production (Units)			
		Materials		Labour & Overhead	
		Degree of Completion	Equivalent Units	Degree of Completion	Equivalent Units
500	W.I.P. (Opening)				
19,500	Units Introduced				
	Completed and transferred to Process B 18,200	100%	18,200	100%	18,200
	Normal Loss 5% 1,000	100%	—	—	—
	Abnormal Loss 400	100%	400	100%	400
	W.I.P. (Closing) 400	100%	400	50%	200
20,000	20,000		19,000		18,800

Statement of Cost of Equivalent Production

Particulars		Cost	Equivalent units	Cost per unit
		Rs		Rs
Materials:	Opening Balance	4,800		
	Material consumed	1,86,200		
	Less: Amount realised for normal loss of 1,000 units @ Re. 1	1,91,000		
		1,000		
		1,90,000	19,000	10.00
Labour:	Opening Balance	3,200		
	Cost of Labour during the month	72,000		
		75,200	18,800	4.00
Overhead:	Opening Balance	6,400		
	Cost incurred during the month	1,06,400		
		1,12,800	18,800	6.00
			20.00	

Statement of Evaluation

1. Output completed and transferred:	18,200 units	@	Rs 20 =	Rs 3,64,000
2. Abnormal loss	400 units	@	Rs 20 =	Rs 8,000
3. Closing Work-in-progress				
Material	400 units	@	Rs 10 =	Rs 4,000
Labour and Overhead:	200 units	@	Rs 10 =	Rs 2,000
				= <u>Rs 6,000</u>

Process A Account for the Month of Dec., 1997

Particulars	Units	Amount		Particulars	Units	Amount	
		Rs				Rs	
To Opening WIP	500	14,400		By Process B (transferred)	18,200	3,64,000	
To Units Introduced		19,500		By Normal Loss	1,000	1,000	
To Cost of Material		1,86,200		By Abnormal Loss	400	8,000	
To Labour		72,000		By WIP (Closing)	400	6,000	
To Overhead		1,06,400					
	20,000	3,79,000			20,000	3,79,000	

Example 10.27

The following data pertains to Process 1 for March 2001 of Beta Ltd.:

Opening Work-in-progress 1,500 units at Rs 15,000
Degree of completion:

Material 100%; Labour and Overheads $33\frac{1}{4}\%$

Input of materials 18,500 units at Rs 52,000
Direct labour Rs 14,000
Overheads Rs 28,000

Closing in work-in-progress 5,000 units
Degree of completion: Material 90% and Labour and Overhead 30%

Normal Process Loss is 10% of total input

(Opening work-in-progress units + Units put in)

Scrap value Rs 2.00 per unit.

Units transferred to the next process: 15,000 units.

You are required to:

- Compute equivalent units of production.
- Compute cost per equivalent unit for each cost element, i.e., material, labour and overheads.
- Compute the cost of finished output and closing work-in-progress.
- Prepare the process and other accounts.

Assume: (i) FIFO Method is used by the Company.

(ii) The cost of opening work-in-progress is fully transferred to the next process.

(CA Inter, B. Com. (Hons), Delhi)

Solution

(a) Statement of Equivalent Units of Production

Input		Output		Equivalent Production			
Particulars	Units	Particulars	Units	Material		Labour & Overhead	
				Units	%	Units	%
Op. WIP	1,500	Work on opening WIP	1,500	—	—	66	1,000

(Cont.)

Input	Output		Equivalent Production				
			Material		Labour & Overhead		
Introduced	18,500	Introduced and completed in the period	13,500	100	13,500	100	13,500
Normal Loss			2,000		—		—
Closing WIP			5,000	90	4,500	30	1,500
			22,000		18,000		16,000
		Less: Abnormal Gain	2,000	100	2,000	100	2,000
	20,000		20,000		16,000		14,000

(b) Statement of Cost per Equivalent Unit for each Cost Element

	Cost	Equivalent units	Cost per equivalent unit
	Rs	Rs	
Material Rs	52,000		
Less: Scrap value	4,000		
	48,000	16,000	3
Labour	14,000	14,000	1
Overheads	28,000	14,000	2

(c) Statement of Cost of Finished Output and Closing Work-in-Progress

Particulars	Elements	Equivalent unit	Cost per unit	Cost of equivalent units	Total
			Rs	Rs	Rs
Opening WIP (1,500 units)	—	—	—	—	15,000
Opening WIP	Material	Nil	—	—	—
"	Labour	1,000	1	1,000	—
"	Overhead	1,000	2	2,000	3,000
Cost of Opening WIP completed during the period					
Units introduced and completed during the period	Material	13,500	3	40,500	
"	Labour	13,500	1	13,500	
"	Overhead	13,500	2	27,000	81,000
Cost of units introduced and completed during the period					
Total Cost of 15,000 Units of Finished Output					99,000
Closing WIP (5,000 Units)	Material	4,500	3	13,500	
	Labour	1,500	1	1,500	
	Overhead	1,500	2	3,000	
Total Cost of Closing WIP (5,000 units)					18,000

(d) Process Account I

	Units	Rs		Units	Rs
To Balance b/d	1,500	15,000	By Normal loss	2,000	4,000
To Units introduced (Direct material)	18,500	52,000	By Transfer to Process I	15,000	99,000
To Direct labour	—	10,000	By Balance c/d	9,000	18,000
To Overhead	—	28,000			
To Abnormal gain (2,000 × 6)	2,000	12,000			
	<u>22,000</u>	<u>1,21,000</u>		<u>22,000</u>	<u>1,21,000</u>

Abnormal Gain Account

To Process I A/c	2,000	4,000			
To Profit & Loss A/c		8,000	By Process I	2,000	12,000
		<u>12,000</u>			<u>12,000</u>

Example 10.28

The following information is given in respect of Process No. 3 for the month of January, 2001.
Opening stock—2,000 units made-up of:

Direct Material-I	Rs 12,350
Direct Material-II	Rs 13,200
Direct Labour	Rs 17,500
Overheads	Rs 11,000

Transferred from Process No. 2: 20,000 units @ Rs 6.00 per unit.

Transferred to Process No. 4: 17,000 units

Expenditure incurred in Process No. 3:

Direct Materials	Rs 30,000
Direct Labour	Rs 60,000
Overheads	Rs 60,000

Scrap: 1,000 units—Direct Materials 100%, Direct Labour 60%, Overheads 40%. Normal Loss 10% of production.

Scrapped units realised Rs 4 per unit.

Closing Stock: 4,000 units—Degree of completion: Direct Materials 80%, Direct Labour 60% and Overheads 40%.

Prepare Process No. 3 Account using average price method, along with necessary supporting statements. (CA Inter, May 2001)

Solution

Statement of Equivalent Production
(Average cost method)

Particulars	Total units	Material I		Material II		Labour		Overhead	
		%	units	%	units	%	units	%	units
Units completely processed	17,000	100	17,000	100	17,000	100	17,000	100	17,000
Normal Loss	1,800	—	—	—	—	—	—	—	—
10% of {2,000 units + 20,000 units – 4,000 units} (Refer to working note)									
Abnormal gain	– 800	100	– 800	100	– 800	100	– 800	100	– 800
Closing stock	4,000	100	4,000	80	3,200	60	2,400	40	1,600
	<u>22,000</u>		<u>20,200</u>		<u>19,400</u>		<u>18,600</u>		<u>17,800</u>

Statement of Cost

	Cost Rs	Equivalent units	Rate/Equivalent (unit) Rs
<i>Material I:</i>			
Opening balance	12,350		
2,000 units			
Cost of 20,000 units	1,20,000		
@ Rs 6/- per unit			
Less: Scrap realised	(7,200)		
(1,800 units × Rs. 4)			
	<u>1,25,150</u>	<u>20,200</u>	<u>6.1955</u>
<i>Material II:</i>			
Opening stock	13,200		
In process II	30,000		
	<u>43,200</u>	<u>19,400</u>	<u>2.2268</u>
<i>Labour:</i>			
Opening labour	17,500		
In process II	60,000		
	<u>77,500</u>	<u>18,600</u>	<u>4.1667</u>
<i>Overhead:</i>			
Opening stock	11,000		
In process II	60,000		
	<u>71,000</u>	<u>17,800</u>	<u>3.9888</u>
Total cost per unit			<u>16.5778</u>

Statement of Evaluation

		Rs
Cost of 17,000 finished goods units (17,000 units × Rs 16.5778)		2,81,822.60 or 2,81,822 (say)
Cost of 800 abnormal unit (800 units × Rs. 16.5778)		13,262.24 or 13,262 (say)
Cost of 4,000 closing work-in-progress units:		48,289.92 or 48,290 (say)
		Rs
Material I	4,000 units × Rs 6.1955	= 24,782.00
Material II	3,200 units × Rs 2.2268	= 7,125.76
Labour	2,400 units × Rs 4.1667	= 10,000.08
Overhead	1,6000 units × Rs 3.988	= 6,382.08
		48,289.92

Process 3 A/c

Dr.					Cr.
<i>Particulars</i>	<i>Units</i>	<i>Rs</i>	<i>Particulars</i>	<i>Units</i>	<i>Rs.</i>
To Opening WIP	2,000	54,050	By Normal loss	1,800	7,200
To Process 2	20,000	1,20,000	By Finished good units	17,000	2,81,822
			By Closing balance	4,000	48,290
To Direct Material II		30,000			
To Direct Labour		60,000			
To Overhead		60,000			
To Abnormal gain	800	13,262			
	22,800	3,37,312		22,800	3,37,312

Working Note: Normal loss given is 10% of production. The word production here means those units which come upto the state of inspection. In that case, opening stock plus receipts minus closing stock of WIP will represent units of production (2,000 units + 20,000 units – 4,000 units). In this case the units of production comes to 18,000 units and hence 1,800 units as normal loss units.

INTER-PROCESS PROFITS

In processing industries, sometimes, the output of each process transferred to the next process is charged at an inflated cost or market value instead of only at actual cost. That is, each process is charged with its input at current prices. Truly speaking, the efficiency of each process should be determined in terms of current prices and not on the basis of a price relating to the previous period. In this manner profit or loss determined will be realistic and remedial action may be taken where the profit on any process is insufficient. The profit or loss made by the transferor process is thus revealed in the process account.

Inter-process profits accounting tends to make the costing records more complicated. Also, such profits will inflate the value of stock and work-in-progress in excess of the actual costs. For final accounting purposes such inflated stocks are to be brought down at the lower cost or market value. Thus, for balance sheet purposes, the values of stocks computed under inter-process profits are not useful. Stock adjustment is needed purely for reasons of prudence and to conform to generally accepted ac-

counting principles. But for individual process accounts, the inclusion of departmental process profits may be necessary.

Example 10.29

The following are the details in respect of Process X and Process Y of a processing factory:

	Process X	Process Y
	Rs	Rs
Material	10,000	—
Labour	10,000	14,000
Overhead	4,000	10,000

The output of Process X is transferred to Process Y at a price calculated to give a profit of 20% on the transfer price and the output of Process Y is charged to finished stock at a profit of 25% on the transfer price. The finished department realised Rs 1,00,000 for the finished goods received from Process Y. You are asked to show process accounts and total profits, assuming there was no opening and no closing work-in-progress. (CA Inter)

Solution

Process X Account

	Rs		Rs
To Material	10,000	By Transfer to Process Y	30,000
To Labour	10,000		
To Overhead	4,000		
To Profit (20% of transfer price)	6,000		
	<u>30,000</u>		<u>30,000</u>

Process Y Account

	Rs		Rs
To Transfer from Process X	30,000	By Transfer to finished stock A/c	72,000
To Labour	14,000		
To Overhead	10,000		
To Profit (25% of the transfer period)	18,000		
	<u>72,000</u>		<u>72,000</u>

Profit and Loss Account

	Rs		Rs
To Cost of sale	72,000	By Sales	1,00,000
To Profit c/d	28,000		
	<u>1,00,000</u>		<u>1,00,000</u>
To Total profit	Rs 52,000	By Profit b/d	Rs 28,000
		By Profit on Process X	6,000
		By Profit on Process Y	18,000
	<u>52,000</u>		<u>52,000</u>

Example 10.30

A Ltd. produces product AXE which passes through two processes before it is completed and transferred to finished stock. The following data relate to October 2001.

Particulars	Process		Finished stock
	I	II	
	Rs	Rs	Rs
Opening stock	7,500	9,000	22,500
Direct materials	15,000	15,750	
Direct wages	11,200	11,250	
Factory overheads	10,500	4,500	
Closing stock	3,700	4,500	11,250
Inter-process profit included in opening stock		1,500	8,250

Output of Process I is transferred to Process II at 25% profit on the transfer price.

Output of Process II is transferred to finished stock at 20% profit on the transfer price. Stocks in process are valued at prime cost. Finished stock is valued at the price at which it is received from Process II. Sales during the period are Rs 1,40,000. Prepare process cost account and finished goods account showing the profit element at each stage. (CA Inter)

Solution

Process I Account

	Total (Rs)	Cost (Rs)	Profit (Rs)		Total (Rs)	Cost (Rs)	Profit (Rs)
Opening stock	7,500	7,500	–	Transfer to	54,000	40,500	13,500
Direct material	15,000	15,000	–	Process II			
Direct wages	11,200	11,200	–	account			
	<u>33,700</u>	<u>33,700</u>					
Less: Closing stock	3,700	3,700					
Prime cost	30,000	30,000	–				
Overhead	10,500	10,500	–				
Process cost	40,500	40,500	–				
Profit (33 $\frac{1}{2}$ % of total cost)	13,500	–	13,500				
(See Working Note I)							
	<u>54,000</u>	<u>40,500</u>	<u>13,500</u>		<u>54,000</u>	<u>40,500</u>	<u>13,500</u>

Process II Account

	Total (Rs)	Cost (Rs)	Profit (Rs)		Total (Rs)	Cost (Rs)	Profit (Rs)
Opening stock	9,000	7,500	1,500	Transfer to finished stock account	1,12,500	75,750	36,750
Transferred from Process I	54,000	40,500	13,500				
Direct material	15,750	15,750	—				
Direct wages	11,250	11,250	—				
	90,000	75,000	15,000				
Less: Closing stock	4,500	3,750	750				
Prime cost	85,500	71,250	14,250				
Overhead	4,500	4,500	—				
Process cost	90,000	75,750	14,250				
Profit (25% on total cost) (See Working Note 2)	22,500	—	22,500				
	1,12,500	75,750	36,750		1,12,500	75,750	36,750

Finished Stock Account

	Total (Rs)	Cost (Rs)	Profit (Rs)	Total (Rs)	Cost (Rs)	Profit (Rs)
Opening stock	22,500	14,250	8,250	1,40,000	82,500	57,500
Transferred from Process II	1,12,500	75,750	36,750			
	1,35,000	90,000	45,000			
Less: Closing stock	11,250	7,500	3,750			
Finished stock cost	1,23,750	82,500	41,250			
Profit	16,250	—	16,250			
	1,40,000	82,500	57,500	1,40,000	82,500	57,500

Working Notes:

Let the transfer price be 100 then profit is 25; i.e., cost price is 75.

- If cost is Rs 75 then profit is Rs 25.
If cost is Rs 40,500 then profit $25/75 \times 40,500 = \text{Rs } 13,500$.
- If cost is Rs 80 then profit is Rs 20.
If cost is Rs 90,000 then profit $20/80 \times 90,000 = \text{Rs } 22,500$.

JOINT PRODUCT AND BY-PRODUCT

Joint Product

Joint products may be defined as distinctly different major products that are inevitably produced simultaneously from common inputs or by common processing. The quantity and sales value of each joint

product are such that none of them may be designated as minor products; all joint products are major products.

Many industries, such as chemicals, oil refining, mining, meat packing and similar industries are involved in such joint production processes and manufacture two or more products from the same raw material. In oil refining, for example, fuel, oil, gasoline, kerosene, lubricating oils are but a few of the many products that emerge.

An increase in the output of one product will bring about an increase in the quantity of others, or vice versa, but not necessarily in the same proportion. At the same phase of production, two or more separately identifiable products will result from the joint production process. This phase or point is referred to as the split-off point.

Joint Products have the following Characteristics:

1. Joint-products are the primary objectives of manufacturing operations.
2. The sales value of each of the joint products are relatively high and none of the joint products are significantly greater in value than other joint products.
3. The joint products may require further processing or may be sold directly after the split-off point.
4. Joint products require simultaneous common processing.
5. The manufacturer has little or no control over the relative quantities of the various products that will result.

By-product

The term "by-product" is often used synonymously with the term "minor products". It refers to those multiple products that have insignificant sales values relative to those of major products. Otherwise, by-products are the same as joint products. By-products are those products that result incidentally from the manufacture of the main product or products. Processing is not aimed in their direction.

ACCOUNTING FOR JOINT PRODUCT COST

When two or more products are classified as joint products, each individual product must be charged with a proportionate share of the total cost of the joint products. Prior to the point of split off, products are not subject to identification and costs are joint; after separation, product identification is possible and costs become separable. Thus, joint cost is a cost incurred prior to the point at which separately identifiable products emerge from the same process.

Accounting for joint product costs achieve the following objectives:

1. Allocating joint product costs incurred prior to the split-off point.
2. Identifying the production costs incurred after the split-off point to process joint products.

If a product is sold immediately after split-off, its unit costs consist totally of allocated joint costs. If a joint product is processed further after split-off, its unit cost will contain allocated joint costs plus the material, labour and overhead costs of additional processing. The following are apportionment bases usually found in practice for apportionment of joint costs:

1. Physical quantity method.
2. Relative market or sales value method.
3. Average unit cost method.
4. Weighted average cost method.

Physical Quantity Method

Under the quantity method, cost allocation is a simple apportionment of cost in proportion to volume. These physical measures may be units, pounds, kilograms, tonnes, gallons, etc.

The following example illustrates this method.

Product	kg product	Proportion to total	Cost allocated (Rs)	Cost per kg (Rs)
A	30,000	1/2	1,80,000	6
B	20,000	1/3	1,20,000	6
C	10,000	1/6	60,000	6
	60,000		3,60,000	6

Relative Market or Sales Value Method

The relative sales value method is often used to apportion joint product costs at the split-off point. The result is a percentage of cost to sales value for the output of the joint process. The sales value of each of the joint products is then multiplied by this percentage to arrive at the apportioned cost for that joint product.

The data given in the above example is being used herewith to explain the sales value method.

Product	Quantity produced	Unit sales price	Sales value of production		Cost apportioned	
		Rs	Amount	%	Total	per unit
A	30,000	4	1,20,000	20	72,000	2.4
B	20,000	9	1,80,000	30	1,08,000	5.4
C	10,000	30	3,00,000	50	1,80,000	18.0
	60,000		6,00,000	100	3,60,000	

Cost can be allocated in the following two ways:

$$1. \text{ Ratio of cost to sales value} = \frac{\text{Rs } 3,60,000}{\text{Rs } 6,00,000} = 60\%$$

$$\text{Product A} \quad 60\% \text{ of Rs } 1,20,000 = \text{Rs } 72,000$$

$$\text{Product B} \quad 60\% \text{ of Rs } 1,80,000 = \text{Rs } 1,08,000$$

$$\text{Product C} \quad 60\% \text{ of Rs } 3,00,000 = \text{Rs } 1,80,000$$

$$2. \text{ Ratio of sales value of product to total sales value applied to total cost:}$$

$$\text{Product A} \quad 20\% \text{ of Rs } 3,60,000 = \text{Rs } 72,000$$

$$\text{Product B} \quad 30\% \text{ of Rs } 3,60,000 = \text{Rs } 1,08,000$$

$$\text{Product C} \quad 50\% \text{ of Rs } 3,60,000 = \text{Rs } 1,80,000$$

Profits under the sales value method move as the sales price

Product	Cost (Rs)	Selling price (Rs)	Profit Amount (Rs)	Profit %
A	72,000	1,20,000	48,000	40%
B	1,08,000	1,80,000	72,000	40%
C	1,80,000	3,00,000	1,20,000	40%

Average Unit Cost Method

This method apportions total manufacturing costs to the various products by using an average unit cost obtained by dividing the total number of units produced into the total manufacturing cost. If all units produced are measured in terms of the same unit and do not differ greatly, this method can be used without much disadvantage. But when the units manufactured are not measured in similar terms, this method cannot be applied.

The average cost is computed by using the following formula:

$$\frac{\text{Total manufacturing cost}}{\text{Total number of units produced}}$$

Weighted Average Cost Method

Under this method, weight factors are often assigned to each unit based upon size of the unit, difficulty of manufacture, time used in making the units, difference in type of labour employed, amount of material used, etc. Finished production of every kind is multiplied by weight factors to apportion total costs to individual units. This method is also known as the survey method.

ACCOUNTING FOR BY-PRODUCTS

By-products can be classified into two categories according to their marketable condition at the split-off point: (i) those sold in their original form without need for any further processing; (ii) those which require further processing in order to be saleable. Because of wide variations in the nature of by-products, different accounting treatments are found in practice, such as the following:

1. *Sales of by-product as other income* If the value of the by-product is comparatively small, many manufacturers treat the by-product like scrap material, and sell it. The sale proceeds of by-product are treated as other income.
2. *Sales of by-products as a reduction in the cost of joint products* This method can be followed by reducing the cost of the main product by the total estimated income from the by-product less the selling expense incurred in effecting the sale of the by-product.
By-products which are not sold, are kept in stock at nil value.
3. *Treating by-products having no cost at the time of separation but charging them with all costs after separation* In such a case, costs incurred after separation should be deducted from the saleable value of the by-product and the balance should be credited to the profit and loss account or the relevant process account.
4. *Recording costs of by-products* This method is applied when the by-products are of relatively high value and also require additional processing after separation from the main product. This requires apportionment of joint costs of the product upto the split-off point. The cost of further processing the by-product is debited to the by-product account. This by-product account is credited with the sale proceeds of the by-products, and any profit or loss is transferred to the costing profit and loss account.

5. *Replacement cost method* The replacement cost method is used in those industries where by-products resulting from the manufacturing process are used within the company. The cost assigned to the by-product is the purchase or replacement cost existing in the market.
6. *Market value (reversal cost) method* This method reduces the manufacturing cost of the main product, not by the actual revenue received, but by an estimated market value of the by-product prevailing at the time the by-product is recovered or sold.

Example 10.31

B Ltd. manufactures Product A which yield two by-products B and C. The actual joint expenses of manufacture for a period were Rs 8,00,000.

It was estimated that the profits on each product as a percentage of sales would be 30%, 25% and 15% respectively. Subsequent expenses were:

	A	B	C
Materials	Rs 10000	Rs 7500	Rs 2500
Direct wages	20000	12500	5000
Overheads	15000	12500	7500
	<u>45000</u>	<u>32500</u>	<u>15000</u>
Sales were	Rs 6,00,000	Rs 4,00,000	Rs 2,50,000

Prepare a statement showing the apportionment of the joint expenses of manufacture over the different products. (B. Com. (Hons), Delhi)

Solution

Statement Showing Apportionment of Joint Costs

		<i>Products</i>		
		A	B	C
Sales		Rs 6,00,000	Rs 4,00,000	Rs 2,50,000
Less: Profit		<u>1,80,000</u>	<u>1,00,000</u>	<u>37,500</u>
	Total cost	4,20,000	3,00,000	2,12,500
Less: Selling expenses (presumed to be as a percentage of sales)		<u>19,200</u>	<u>12,800</u>	<u>8,000</u>
	Cost of manufacturing	4,00,800	2,87,200	2,04,500
Less: Subsequent costs		<u>45,000</u>	<u>32,500</u>	<u>15,000</u>
	Share of joint costs	<u>3,55,800</u>	<u>2,54,700</u>	<u>1,89,500</u>

Working Notes:

	Total costs of all products (Rs 4,20,000 + Rs 3,00,000 + Rs 2,12,500)	9, 32,500
Less:	Total manufacturing costs (Rs 8,00,000 + 92,500)	<u>8,92,500</u>
	Balance being selling expenses	<u>40,000</u>

Example 10.32

Bright Chemicals Ltd. electrolyses common salt to obtain three joint products—caustic soda, chlorine and hydrogen. During a costing period, the expenditure relating to the inputs for the common process amounted to Rs 3,50,000. After separation, expenses amounting to Rs 1,60,000, Rs 75,000, and Rs 10,000 were incurred for caustic soda, chlorine and hydrogen respectively. The entire production was sold and Rs 3,75,000; Rs 2,50,000; and 60,000 were realised for caustic soda, chlorine and hydrogen respectively. The selling expenses were estimated at 5% of realisations from sale. The management expected profits @ 15%; 10% and 5% of realisations from sale of caustic soda, chlorine and hydrogen respectively.

Draw a columnar statement showing the apportionment of joint costs and the profitability of each product. (ICWA Inter)

Solution

Statement Showing the Apportionment of Joint Costs and Profitability

<i>Particulars</i>	<i>Caustic Soda Rs</i>	<i>Chlorine Rs</i>	<i>Hydrogen Rs</i>	<i>Total Rs</i>
Realisations from Sale	3,75,000	2,50,000	60,000	6,85,000
Less: Expected profits (15%, 10% and 5% on realisation)	56,250	25,000	3,000	84,250
Estimated total cost	3,18,750	2,25,000	57,000	6,00,750
Less: Selling expenses (5% on realisation)	18,750	12,500	3,000	34,250
Estimated cost of production	3,00,000	2,12,500	54,000	5,66,500
Less: Separation costs	1,60,000	75,000	10,000	2,45,000
Estimated shares of joint costs	1,40,000	1,37,500	44,000	3,21,500
Estimated percentage of shares of same				
Cost to total costs	43.5%	42.8%	13.75%	100%
Actual Shares of Joint Costs (43.5: 42.8: 13.7)	1,52,250	1,49,800	47,950	3,50,000
Add: Post Separation Costs	1,60,000	75,000	10,000	2,45,000
Actual Costs of Production	3,12,250	2,24,800	57,950	5,95,000
Add: Selling expenses (5% on realisation)	18,750	12,500	3,000	34,250
Total Cost	3,31,000	2,37,300	60,950	6,29,250
Profits (Loss) balancing figure	44,000	12,700	(950)	55,750
Sales	3,75,000	2,50,000	60,000	6,85,000

Example 10.33

Two products *P* and *Q* are obtained in a crude form and require further processing at a cost of Rs. 5 for *P* and Rs. 4 for *Q* per unit before sale. Assuming a net margin of 25 per cent on cost, their sale prices are fixed at Rs. 13.75 and Rs 8.75 per unit respectively. During the period, the joint cost was Rs. 88,000 and the outputs were:

P 8,000 units

Q 6,000 units

Ascertain the joint cost per unit.

(CA Inter May 1998)

Solution

Statement Ascertaining joint cost per unit

Output (Units) Products	8,000 P	6,000 Q
	Rs	Rs
Selling Price per unit	13.75	8.75
Less: Margin @ 25% on Cost or 20% on Sales	2.75	1.75
Cost of Sales	11.00	7.00
Less: Post Split off Cost	5.00	4.00
Joint Cost per unit	6.00	3.00
Share in joint cost of units P and Q can be obtained by apportioning it in the ratio of 8 : 3 (W/N)	64,000	24,000
Ascertained joint Cost per unit	8.00	4.00
	(Rs. 64,000/8,000 units)	(Rs 24,000/6,000 units)

Working Note:

Output (Units)	8,000		6,000
Total Pre-split off Cost (Rs.) (8,000 × 6)	48,000	(6,000 × 3)	18,000
Total Joint Cost Ratio between two products	8		3

Example 10.34

In the course of manufacture of the main product 'P', by-products 'A' and 'B' also emerge. The joint expenses of manufacture amount to Rs. 1,19,550. All the products are processed further after separation and sold as per details given below:

	Main Product	By-product	
	P	A	B
	(Rs)	(Rs)	(Rs)
Sales	90,000	60,000	40,000
Cost beyond split-off stage	6,000	5,000	4,000
Profit as percentage of sales	25%	20%	15%

Selling and administration overheads are absorbed as percentage of cost of sales. Prepare a statement showing the apportionment of joint cost to the main product and by-products. Also prepare main product 'P' account. (B. Com. Hons, Delhi, 2001)

Solution

Statement showing the Apportionment of Joint Costs

	Main Product	By product		Total
	P	A	B	
	Rs	Rs	Rs	Rs
Sales	90,000	60,000	40,000	1,90,000
Less: Profit (i.e. 25%, 20% and 15% respectively from P, A and B)	22,500	12,000	6,000	40,500

(contd.)

	Main Product P	By product		Total
		A	B	
Cost of sales	67,500	48,000	34,000	1,49,500
Less: Selling expenses (675 : 480 : 340)				
Rs 1,49,500 – Rs. 1,19,550 – 14,000 = Rs. 14,950	6,750	4,800	3,400	14,950
Cost of Production	60,750	43,200	30,600	1,34,550
Less: Cost after separation	6,000	5,000	4,000	15,000
Value at split-off point	54,750	38,200	26,600	1,19,550

P (Main Product) Account

To Joint expenses of Manufacture	1,19,550	By transfer of share in Joint expenses	
To Separate Expenses	6,000	By Product A	38,200
		By Product B	26,600
		By Cost of Product of P	60,750
	1,25,550		1,25,550
To Cost of Product P	60,750	By Sales	90,000
To Selling and Admn.Exp.	6,750		
To Profit	22,500		
	90,000		90,000

Example 10.35

A factory is engaged in the production of a chemical BOMEX and in the course of its manufacture, a by-product BRUCIL is produced, which after further processing has a commercial value. For the month of April, 2001, the following are the summarised cost data:

	Joint Expenses Rs	Separate Expenses	
		BOMEX Rs	BRUCIL Rs
Materials	1,00,000	6,000	4,000
Labour	50,000	20,000	18,000
Overheads	30,000	10,000	6,000
Selling price per unit		98	34
Estimated profit per unit on sale of BRUCIL			4
No. of units produced		Units 2,000	Units 2,000

The factory uses reverse cost method of accounting for by-products whereby the sales value of by-products after deduction of the estimated profit, post separation costs and selling and distribution expenses relating to the by-products is credited to the joint process cost account.

You are required to prepare statement showing:

- (i) the Joint Cost allocable to BOMEX.
 (ii) the product-wise and overall profitability of the factory for April, 2001.

(CA Inter)

Solution

(i) Statement of Joint Cost Allocable to BOMEX

<i>Total joint expenses</i>	<i>Rs</i>	<i>Rs</i>
Materials	1,00,000	
Labour	50,000	
Overheads	30,000	
		1,80,000
<i>Less:</i> Joint Cost allocable to the production of 2,000 units of BRUCIL at the split-off point (See Working Note)		32,000
Cost of production of 2,000 units of BOMEX		1,48,000

(ii) Productwise and Overall Profitability Statement for the Month of April 2001

<i>Particulars</i>	<i>Products</i>		<i>Total</i> Rs
	BOMEX	BRUCIL	
Sales (Units)	2,000	2,000	
Selling price per unit (Rs)	98	34	
Total sales (Rs)	1,96,000	68,000	
<i>Less:</i> Cost of production at the split off point	1,48,000	32,000	
Post Separation Cost	36,000	28,000	
	1,84,000	60,000	
Profit (Rs)	12,000	8,000	20,000

Working Note:

Computation of the joint Expenses Chargeable to the By-product BRUCIL

Units produced	2,000
Selling price unit (Rs)	34
Total Sales: (2,000 × Rs 34) (Rs)	68,000
<i>Less:</i> Profit (2,000 × Rs 4)	8,000
Cost of Sales	60,000
<i>Less:</i> Selling and distribution expenses	Nil
<i>Less:</i> Expenses after separation (Rs 4,000 + Rs 18,000 + Rs 6,000)	28,000
Cost of Production at the split-off point	32,000

Example 10.36

In manufacturing the main product A, a company processes the resulting waste material into two by-products M_1 and M_2 . Using the method of working back from sales value to an estimated cost, you are required to prepare a comparative profit and loss statement of the three products from the following data:

(i) Total cost upto separation point was Rs 1,36,000.			
	A	M_1	M_2
(ii) Sale (all production)	Rs 3,28,000	Rs 32,000	Rs 48,000
(iii) Cost after separation	-	Rs 9,600	Rs 14,400
(iv) Estimated net profit percentage to sale value	-	20%	30%
(v) Estimated selling expenses as percentage of sale value	20%	20%	20%

(ICWA Inter)

Solution**Statement showing Apportionment of Joint Costs**

<i>Particulars</i>	<i>By-products</i>	
	M_1 Rs	M_2 Rs
Sales Value	32,000	48,000
Less: Estimated net profit:		
For M_1 : 20% of sales value	6,400	
For M_2 : 30% of sales value		14,400
Total Cost of Sales	25,600	33,600
Less: Estimated selling expenses (20% of sales value)	6,400	9,600
	19,200	24,000
Less: Cost after separation	9,600	14,400
Total cost up to separation	9,600	9,600
Total cost up to separation point of main process		Rs 1,36,000
Less: Cost up to separation point as shown above for		
By-product M_1 Rs 9,600		
By-product M_2 Rs 9,600		
		Rs 19,200
Cost up to separation for Main Product A		Rs 1,16,800

Comparative Profit and Loss Statement

Particulars	Total	For main product 'A'	For by-products	
			M ₁	M ₂
	(Rs)	(Rs)	(Rs)	(Rs)
Cost up to separation	1,36,000	1,16,800	9,600	9,600
Cost after separation	24,000		9,600	14,400
Total Cost (1)	1,60,000	1,16,800	19,200	24,000
Sales (2)	4,08,000	3,28,000	32,000	48,000
Gross Profit (2) -- (1)	2,48,000	2,11,200	12,800	24,000
Less: Selling expenses 20% of sales value	81,600	65,600	6,400	9,600
Net Profit	1,66,400	1,45,600	6,400	14,400

Example 10.37

In a concern engaged in process industry, four products emerge from a particular process of operation. The total cost of input for the period ended 30th September, 2002 is Rs 2,53,500. The details of output, additional cost after "split-off point" and sales value of the products are appended below.

Product	Output kg	Additional processing cost after split-off point Rs	Sales value
			Rs
A	8,000	60,000	1,68,000
B	5,000	10,000	1,10,000
C	3,000	—	60,000
D	4,000	20,000	90,000

If the products are sold at "split-off point" without further processing, the sales value would have been

	Rs
A	1,15,000
B	90,000
C	55,000
D	80,000

You are required to prepare a statement of profitability based on the products being sold:

- after further processing, and
- at the split-off point.

(ICWA Inter)

Solution**(i) Statement of Profitability after Further Processing**

Products	Sales value	Additional processing cost	Equivalent sales value at split-off point	Share in joint cost	Total cost	Profit
	Rs	Rs	Rs	Rs		Rs
A	1,68,000	60,000	1,08,000	81,000	1,41,000	27,000 (contd.)

Products	Sales value	Additional processing cost	Equivalent sales value at split-off point	Share in joint cost	Total cost	Profit
B	1,10,000	10,000	1,00,000	75,000	85,000	25,000
C	60,000	—	60,000	45,000	45,000	15,000
D	90,000	20,000	70,000	52,500	72,500	17,500
Total	4,28,000	90,000	3,38,000	2,53,500	3,43,500	84,500

Note: Joint Cost has been apportioned on the basis of equivalent sales value at the split-off point.

(ii) Statement of Profitability if Sold at Split-off point

Products	Sales value Rs	Joint cost Rs	Profit Rs
A	1,15,000	85,743	29,257
B	90,000	67,103	22,897
C	55,000	41,007	13,993
D	80,000	59,647	20,353
Total	3,40,000	2,53,500	86,500

Note: Joint Cost has been apportioned on the basis of sales value of the different products.

Example 10.38

Raw materials 'X' costing Rs 100 per kilogram and 'Y' costing Rs 60 per kilogram are mixed in equal proportions for making product 'A'. The loss of materials in processing works out to 25% of the output. The production expenses are allocated at 50% of direct materials cost. The end product is priced with a margin of $33\frac{1}{2}\%$ over the total cost. Material 'Y' is not easily available and substitute raw material 'Z' has been found for 'Y' costing Rs 50 per kilogram. It is required to keep the proportion of this substitute material in the mixture as low as possible and at the same time maintain the selling price of the end product at existing levels and ensure the same quantum of profit as at present.

You are required:

To compute what should be the ratio of mix of the raw materials X and Z.

(CA Inter.)

Solution

Basic Calculations

(i) Percentage of Loss of Output: 25%

Let 1 kg be the output of product A,

The input of material X and Y would be 1.25 kg

Proportion of material X and Y in the output 1 kg of Product A will be as under:

$$X: 1.25/2 \text{ kg} = 0.625 \text{ kg}$$

$$Y: 1.25/2 \text{ kg} = 0.625 \text{ kg}$$

(ii) Computation of Cost Structure and Price
(for 1 kg of Product A)

	Rs
Material X (0.625 kg × Rs 100)	62.50
Material Y (0.625 kg × Rs 60)	37.50
Total material cost	100.00
Add: Production expenses (50% of material cost)	50.00
Total Cost	150.00
Add: Product 33 1/3% of total cost	50.00
Selling price	200.00

Proportion of Materials X and Z in the Product A

Let us assume the minimum quantity of Material Z in the Product A as z kg. This means that $(1.25 - z)$ kg of Material X is required to be used for producing 1 kg of Product A. (See calculation (i) above).

In order to maintain the level of profit and the selling price (see calculation (ii) above), it is necessary that the total cost of material in 1 kg of Product A should not exceed Rs 100. Thus, the following equation can be formed:

$$z \text{ kg} \times \text{Rs } 50 + (\text{Rs } 1.250 - z) \text{ kg} \times \text{Rs } 100 = \text{Rs } 100$$

$$\text{or} \quad 50z + 125 - 100z = 100$$

$$\text{or} \quad -50z = -25$$

$$\text{or} \quad z = .5 \text{ kg}$$

Hence the quantity of X material = $1.25 \text{ kg} - 0.50 \text{ kg} = 0.75 \text{ kg}$. The proportion of Materials X and Z will be = $0.75 : 0.50 = 3:2$.

Example 10.39

The yield of a certain process is 80% as to the main product, 15% as to the by-product and 5% as to the process loss. The material put in process (5,000 units) cost Rs 23,75 per unit and all other charges are Rs 14,250, of which power cost accounted $33\frac{1}{2}\%$.

It is ascertained that power is chargeable as to the main product and by-product in the ratio of 10:9. Draw up a statement showing the cost of the by-product.

(CA Inter.)

*Solution***Statement Showing the Cost of the By-product**

Cost of Material	18,750
(5,000 × 2/3) × 750/4750	
Other charges (except power)	1,500
(Rs 14,250 × 2/3) × 750/4750	2,250
Power (Rs 14,250 × 1/3 × 9/19)	
Total Cost	22,500

Working Note:

	Yield per 50,000 input units	
Main product	80%	4,000
By-product	15%	750
Process loss	5%	250

Example 10.40

A company manufactures products A, B, and C from a joint process. Additional data are as follows:

	Product			
	A	B	C	Total
Units produced	8,000	4,000	2,000	14,000
Joint costs	Rs 72,000	a	b	Rs 1,20,000
Sales value at split-off	c	d	Rs 30,000	2,00,000
Additional costs to process further	14,000	10,000	6,000	30,000
Sales value if processed further	1,40,000	60,000	40,000	2,40,000

Derive the values for the lettered spaces.

Solution

Joint costing—Finding missing values.

Since joint costs are allocated on the basis of relative sales value, we know that the fraction,

$$\frac{\text{Joint cost}}{\text{Sale value at split-off}}$$

will be the same for all three products and for the total.

For total costs, the ratio is

$$\frac{\text{Rs } 1,20,000}{\text{Rs } 2,00,000} = .6$$

For Product A, since the allocated costs are known, we can express the relationship between allocated costs and sales value at split-off as

$$\begin{aligned} .6X &= \text{Rs } 72,000 \\ X &= \frac{72,000}{.6} \\ &= \text{Rs } 1,20,000 \text{ (Ans. c)} \end{aligned}$$

For Product C, allocated joint costs are unknown. Since the costs equal .6 of the relative sales value at split-off, the costs allocated to C are

$$\begin{aligned} X &= \text{Rs } 30,000 \times .6 \\ &= \text{Rs } 18,000 \text{ (Ans. b)} \end{aligned}$$

Having found the costs and relative sales values for A and C. We subtract them from the total to find the missing values for Product B.

Total Relative Sales Value	Rs 2,00,000	
<i>Less:</i>		
Value of A	(1,20,000)	
Value of C	(30,000)	
Value of B	Rs 50,000	(Ans. d)

Since allocated joint costs are .6 of relative sales value.

$$\text{Rs } 50,000 \times .6 = \text{Rs } 30,000 \text{ (Ans. a)}$$

Proof:

$$\begin{aligned} \text{Total Allocated Costs} &= \text{Rs } 1,20,000 \\ \text{Rs } 72,000 + \text{Rs } 30,000 + \text{Rs } 18,000 &= \text{Rs } 1,20,000. \end{aligned}$$

Example 10.41

JB Limited produces four joint products, A, B, C, and D, all of which emerge from the processing of one raw material. The following are the relevant data:

Production for the period:

Joint Product	Number of units	Selling price per unit
A	500	18.00
B	900	8.00
C	400	4.00
D	200	11.00

The company budgets for a profit of 10% on sales value. The other estimated costs are:

Carriage inwards	1,000
Direct wages	3,000
Manufacturing overhead	2,000
Administration overhead	10% of the sales value

You are required to:

- Calculate the maximum price that may be paid for the raw material.
- Prepare a comprehensive cost statement for each of the products allocating the materials and other costs based upon.
 - Number of units
 - Sales value

(CA Inter.)

Solution

(a) Computation of Maximum Price that may be Paid for the Raw Material

	Rs	Rs
Cost of Joint Products (Note (ii))		18,000
<i>Less</i> Other Costs:		
Carriage inwards	1,000	
Direct wages	3,000	

Manufacturing overhead	2,000	
Administration overhead	2,000	8,000
Maximum price to be paid for the Raw Material		<u>10,000</u>

Working Notes:

(i) Computation of Total Sales Value

Joint products (1)	No. of units (2)	Selling price per unit (3)	Sales value (4) i.e. (2) × (3)
		Rs	Rs
A	500	18	9,000
B	900	8	7,200
C	400	4	1,600
D	200	11	2,200
		Total	<u>20,000</u>

(ii) Total Cost of Joint Products

= Total sales value - budgeted profit (10% of sales value)

= Rs 20,000 - Rs 2,000

= Rs 18,000

(b) (i) Comprehensive Cost Statement (Based on Units)

	Joint Products				Total
	A	B	C	D	
Units:	500	900	400	200	2,000
	Rs	Rs	Rs	Rs	Rs
Raw material	2,500	4,500	2,000	1,000	10,000
Carriage	250	450	200	100	1,000
Direct wages	750	1,350	600	300	3,000
Manufacturing overhead	500	900	400	200	2,000
Administration overhead	500	900	400	200	2,000
Total Cost	<u>4,500</u>	<u>8,100</u>	<u>3,000</u>	<u>1,800</u>	<u>18,000</u>

(ii) Comprehensive Cost Statement (Based on Sales Value)

Sales value	9,000	7,200	1,600	2,200	20,000
Raw material	4,500	3,600	800	1,100	10,000
Carriage	450	360	80	110	1,000
Direct wages	1,350	1,080	240	330	3,000
Manufacturing overhead	900	720	160	220	2,000
Administration overhead	900	720	160	220	2,000
Total Cost	<u>8,100</u>	<u>6,480</u>	<u>1,440</u>	<u>1,980</u>	<u>18,000</u>

Example 10.42

A company processes a raw material in its department 1 to produce three products, viz, *A*, *B* and *X* at the same split-off stage. During a period 1,80,000 kgs of raw materials were processed in Department 1 at a total cost of Rs 12,88,000 and the resultant output of *A*, *B* and *X* were 18,000 kgs 10,000 kgs. and 54,000 kgs respectively. *A* and *B* were further processed in Department 2 at a cost of Rs 1,80,000 and Rs 1,50,000 respectively.

X was further processed in Department 2 at a cost of Rs 1,80,000. There is no waste in further processing. The details of sales effected during the period were as under:

Particulars		<i>A</i>	<i>B</i>	<i>X</i>
Quantity Sold	(kgs.)	17,000	5,000	44,000
Sales Value	(Rs.)	12,24,000	2,50,000	7,92,000

There were no opening stocks. If these products were sold at split-off stage, the selling prices of *A*, *B* and *X* would have been Rs 50, Rs 40 and Rs 10 per kg respectively.

Required:

- Prepare a statement showing the apportionment of joint costs to *A*, *B* and *X*.
- Present a statement showing the cost per kg of each product indicating joint cost, further processing cost and total cost separately.
- Prepare a statement showing the product wise and total profit for the period.
- State with supporting calculations as to whether any or all the products should be further processed or not.

(C.A. Inter Nov. 1996)

Solution

(i) Statement of Apportionment of Joint Costs

Products	<i>A</i>	<i>B</i>	<i>X</i>	Total
Output (kg)	18,000	10,000	54,000	
Sales Value at the point of split off (Rs)	9,00,000 (Rs 50 × 18,000)	4,00,000 (Rs 40 × 10,000)	5,40,000 (Rs 10 × 54,000)	18,40,000
Joint Cost Apportionment on the basis of sales value at the point of split off (Rs)	6,30,000	2,80,000	3,78,000	12,88,000
	$\left\{ \frac{\text{Rs } 12,88,000}{\text{Rs } 18,40,000} \times 9,00,000 \right\}$	$\left\{ \frac{\text{Rs } 12,88,000}{\text{Rs } 18,40,000} \times \text{Rs } 4,00,000 \right\}$	$\left\{ \frac{\text{Rs } 12,88,000}{\text{Rs } 18,40,000} \times \text{Rs } 5,40,000 \right\}$	

(ii) Statement of the Cost Per kg of Each Product
(indicating Joint Cost, Further Processing Cost and Total Cost Separately)

Products	A	B	X
Joint Costs apportioned (Rs) : (1) [Refer to (i) above]	6,30,000	2,80,000	3,78,000
Production (kg) : (2)	18,000	10,000	54,000
Joint cost per kg (Rs) : (1 ÷ 2)	35	28	7
Further Processing Cost per kg. (Rs)	10	15	2
	{ Rs 1,80,000 } 18,000 kg	{ Rs 1,50,000 } 10,000 kg	{ Rs 1,08,000 } 54,000 kg
Total Cost per kg (Rs)	45	43	9

(iii) Statement of Product Wise and Total Profit for the Period

Products	A	B	X	Total
Sales Value (Rs)	12,24,000	2,50,000	7,92,000	
Add: Closing Stock Value (Rs) (WNZ)	45,000	2,15,000	90,000	
(1) Value of Production (Rs)	12,69,000	4,65,000	8,82,000	26,16,000
Apportionment of Joint Cost (Rs) [Refer to (i) above]	6,30,000	2,80,000	3,78,000	
Add: Further Processing Cost (Rs)	1,80,000	1,50,000	1,08,000	
(2) Total Cost (Rs)	8,10,000	4,30,000	4,86,000	17,26,000
Profit (Rs. : (Rs. : (1) - (2))	4,59,000	35,000	3,96,000	8,90,000

Working Notes:

1. Products	A	B	X	Total
Sales Value (Rs)	12,24,000	2,50,000	7,92,000	
Quantity sold (kgs)	17,000	5,000	44,000	
Selling Price Rs per kg	72	50	18	
	{ Rs 12,24,000 } 17,000 kgs	{ Rs 2,50,000 } 5,000 kgs	{ Rs 7,92,000 } 44,000	

2. Valuation of Closing Stock:

The selling price per kg of products A, B and X is more than their total costs, hence closing stock will be valued at cost.

Products:	A	B	X	Total
Closing Stock (kg)	1,000	5,000	10,000	
Cost per kg (Rs)	45	43	9	
Closing Stock Value (Rs)	45,000	2,15,000	90,000	3,50,000
	(Rs 45 × 1,000 kg)	(Rs 43 × 5,000 kg)	(Rs 9 × 10,000 kg)	

(iv) Calculations for Processing Decision:

Products	A	B	X
Selling Price per kg at the point of split off (Rs)	50	40	10
Selling price per kg after further processing (Rs)	72	50	18
(Working Note 1)			
(Incremental Selling Price per kg (Rs))	22	10	8
Less: Further Processing			
Cost per kg (Rs)	10	15	2
Incremental Profit (Loss) per kg (Rs)	12	(-5)	6

From the above computations it is clear that Product B does not give any profit on further processing; hence it should not be further processed.

Example 10.43

Sunmoon Ltd. produces 2,00,000; 30,000; 25,000; 20,000 and 75,000 units of its five products A, B, C, D and E respectively in a manufacturing process and sells them at Rs 17, Rs 13, Rs 8, Rs 10 and Rs 14 per unit. Except product D, remaining products can be further processed and then can be sold at Rs 25, Rs. 17, Rs and Rs. 20 per unit in case of A, B, C and E respectively.

Raw material costs Rs 35,90,000 and other manufacturing expenses cost Rs 5,47,000 in the manufacturing process which are absorbed on the products on the basis of their 'Net realisable value'. The further processing costs of A, B, C and E are Rs 12,50,000; Rs 1,50,000; Rs 50,000 and Rs 1,50,000 respectively. Fixed costs are Rs 4,73,000.

You are required to prepare the following in respect of the coming year:

- Statement showing income forecast of the company assuming that none of its products are to be further processed.
- Statement showing income forecast of the company assuming that products A, B, C and E are to be processed further.

Can you suggest any other production plan whereby the company can maximise its profits. If yes, then submit a statement showing income forecast arising out of adoption of that plan.

(C.A. Inter Nov 1997)

Solution**Basic Calculations**

**Statement of Apportionment of Joint Costs
(on net realisable value basis)**

Products	Sales Value	Post Separation (Cost)	Net Realisable Value	Apportioned Joint Costs
	(1) Rs	(2) Rs	(1) - (2) = (3) Rs	(4) Rs
A	50,00,000 (2,00,000 units × Rs 25)	12,50,000	37,50,000	26,25,000
B	5,10,000 (30,000 units × Rs 17)	1,50,000	3,60,000	2,52,000

(Cont.)

Products	Sales Value	Post Separation (Cost)	Net Realisable Value	Apportioned Joint Costs
	(1) Rs	(2) Rs	(1) - (2) = (3) Rs	(4) Rs
C	3,00,000 (25,000 units × Rs 12)	50,000	2,50,000	1,75,000
D	2,00,000 (20,000 units × Rs 10)	—	2,00,000	1,40,000
E	15,00,000 (75,000 units × Rs 20)	1,50,000	13,50,000	9,45,000
			<u>59,10,000</u>	<u>41,37,000</u>

Total Joint Cost = Raw Material Costs + Manufacturing Expenses
 = Rs 35,90,000 + Rs 5,47,000 = Rs 41,37,000
 apportioned in the ratio of 375 : 36 : 25 : 20 : 135
 = Rs 41,37,000 / 1,591 × 375 = Rs 26,25,000
 For example for product A
 On the same basis, the apportioned joint cost for products B, C, D and E are Rs 2,52,000;
 Rs 1,75,000; Rs 1,40,000 and Rs 9,45,000 respectively.

(a) Statement of Company's Income Forecast Assuming that None of Its Products are Further Processed

Products Particulars	A Rs	B Rs	C Rs	D Rs	E Rs	Total Rs
1. Units Sold	2,00,000	30,000	25,000	20,000	75,000	
2. Selling Price per unit	Rs 17	Rs 13	Rs 8	Rs 10	Rs 14	
3. Sales Revenue	34,00,000	3,90,000	2,00,000	2,00,000	10,50,000	52,40,000
4. Apportioned Joint Cost	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
5. Excess of Revenue over apportioned Joint Cost (3) - (4)	7,75,000	1,38,000	25,000	60,000	1,05,000	11,03,000
6. Fixed Cost						4,73,000
7. Profit (5) - (6)						<u>6,30,000</u>

(b) Statement of Company's Income Forecast Assuming that Products A, B, C and E are Further Processed

Products Particulars	A Rs	B Rs	C Rs	D Rs	E Rs	Total Rs
1. Sales Revenue	50,00,000	5,10,000	3,00,000	2,00,000	15,00,000	75,10,000
2. Apportioned Joint Cost	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
3. Further Processing Cost	12,50,000	1,50,000	50,000	—	1,50,000	16,00,000
4. Total Manufacturing Cost (2) + (3)	38,75,000	4,02,000	2,25,000	1,40,000	10,95,000	57,37,000

(Cont.)

<i>Particulars</i>	<i>Products</i>						<i>Total</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>Rs</i>	
	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>
5. Excess of Sales Revenue over total Manufacturing Cost (1) – (4)	11,25,000	1,08,000	75,000	60,000	4,05,000	17,73,000	4,73,000
6. Fixed Cost							13,00,000
7. Profit (1) – (6)							

Suggested production plan for maximising profits: A comparison of Statements (a) and (b) shows that the company is earning more after further processing of A, C and E products but is losing a sum of Rs 30,000 (Rs 1,38,000 – Rs 1,08,000) in the case of product B on its being processed further. Hence, the best production plan will be to sell A, C and E after further processing and B, D at the point of split off. Based on this suggested production the profit will be as follows:

Profit Statement Based on Suggested Production Plan

<i>Particulars</i>	<i>Products</i>						<i>Total</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>Rs</i>	
	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>	<i>Rs</i>
1. Sales Revenue	50,00,000	3,90,000	3,00,000	2,00,000	15,00,000	73,90,000	41,37,000
2. Apportioned Joint Cost	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	14,50,000	55,87,000
3. Further Processing Cost	12,50,000	–	50,000	–	1,50,000	14,50,000	18,03,000
4. Total Manufacturing Cost (2) + (3)	38,75,000	2,52,000	2,25,000	1,40,000	10,95,000	55,87,000	4,73,000
5. Excess of Sales Revenue over Manufacturing Cost (1) – (4)	11,25,000	1,38,000	75,000	60,000	4,05,000	18,03,000	13,30,000
6. Fixed Cost							13,30,000
7. Profit (5) – (6)							

The above statement shows that the profit of the company has increased by Rs 30,000.

Example 10.44

A company purchases raw materials worth Rs 11.04 lakhs and processes them into four products P, Q, R and S, which have a unit sale value of Rs 3, Rs 9, Rs 16 and Rs 60 respectively at split-off point, as they could be sold as such to other processors. However, during a year, the company decided to further process and sell products P, Q and S, while R was not to be processed further but sold at split-off point to other processors. The processing of raw materials into the four products cost Rs 28 lakhs to the company. The other data for the year were as under:

<i>Product</i>	<i>Output</i> <i>(units)</i>	<i>Sales</i> <i>(Rs in lakhs)</i>	<i>Additional processing</i> <i>Cost after split-off</i> <i>(all variable costs)</i> <i>(Rs in lakhs)</i>
P	10,00,000	46.00	12.00
Q	20,000	4.00	2.40
R	10,000	1.60	–
S	18,000	12.000	0.40

You are required to work out the following information for managerial decision-making:

- If the joint costs are allocated amongst the four products on the basis of 'Net realisable Value' at split-off point, what would be the company's annual income?
- If the company had sold off all the other three products at split-off stage, identify the increase/decrease in the company's annual income as compared to (a) above.
- What sales strategy could the company have planned to maximise its profit in the year?
- Identify the net increase in income if the strategy at (c) is adopted, as compared to (a) above.

(I.C.W.A. Inter Dec. 1996)

Solution

Statement of Annual Income for Four Products

					(Rs in lakhs)
Product	Sales	Share of Joint Cost (See WN)	Additional Processing Cost after Split-off	Total Cost	Net Income
(1)	(2)	(3)	(4)	(5)	(2) - (5)
P	46.00	27.20	12.00	39.20	6.80
Q	4.00	1.28	2.40	3.68	0.32
R	1.60	1.28	-	1.28	0.32
S	12.00	9.28	0.40	9.68	2.32
Total	63.60	39.04	14.80	53.84	9.76

Working Note:

**(a) Statement of Apportionment of Joint Cost Amongst Products P, Q, R and S
(Under Net Realisable Value at Split-off Point Method)**

					(Rs in lakhs)
Products	Sales Value	Additional Processing Cost	Net Realisation Value at split-off point (2) - (3) = (4)	Computation (11.04 + 28)	Share of Joint Costs
(1)	(2)	(3)	(4)	(5)	(6)
P	46.00	12.00	34.00	$\frac{39.04 \times 34.00}{48.80}$	27.20
Q	4.00	2.40	1.60	$\frac{39.04 \times 1.60}{48.80}$	1.28
R	1.60	-	1.60	$\frac{39.04 \times 1.60}{48.80}$	1.28
S	12.00	0.40	11.60	$\frac{39.04 \times 11.60}{48.80}$	9.28
Total	63.60	14.80	48.80		39.04

(b) Statement of Annual Income
(If all products, were sold at split-off stage)

Particulars	Products				Total
	P	Q	R	S	
Output (Units)	10,00,000	20,000	10,000	18,000	
Sales Value per unit (Rs)	3	9	16	60	
Total Sales Value (Rs. in lakhs)	30.00	1.80	1.60	10.80	44.20
Joint Cost (Rs in lakhs) (allocated)	27.20	1.28	1.28	9.28	39.04
Net Profit (Rs in lakhs)	2.80	0.52	0.32	1.52	5.16

Comments:

In case the company adopts alternative (b) above, the annual income will decline by Rs 4.60 lakhs (9.76 – 5.16) as compared to alternative (a) above.

(c) In view of above comparative alternatives (a) and (b), the company could have planned the following sales strategy for maximization of profit in the year.

- (i) Products P and S could be sold after further processing under alternative (a) where more profit is generated as compared to alternating (b).
- (ii) Product Q could be sold at split-off point without further processing. This would further increase profit as compared to (a).
- (iii) Product R could be sold at split-off point as it gives same profit under alternatives (a) and (b).

(d) Statement Showing Annual Income Under Strategy (c)

Particulars	Products				Total
	P	Q	R	S	
	Rs	Rs	Rs	Rs	Rs
(1) Sales Value	46.00	1.80	1.60	12.00	61.40
(2) Costs:					
Joint Cost	27.20	1.28	1.28	9.28	39.04
Additional Processing Cost after split-off	12.00	—	—	0.40	12.40
Total Cost	39.20	1.28	1.28	9.68	51.44
(3) Net Income (1) - (2)	6.80	0.52	0.32	2.32	9.96

Comments: The above table shows that the overall net income will increase by Rs. 0.20 lakhs, i.e. (Rs 9.96 lakhs – Rs 9.76 lakhs) as compared to present policy at (a) above in case strategy (c) is adopted. Thus products Q and R should be sold at split-off point while P and S should be further processed.

Example 10.45

Inorganic Chemicals purchases salt and processes it into more-refined products such as caustic soda, chlorine, and PVC (Polyvinyl chloride). During the month of April, 2000. Inorganic Chemicals purchased salt for Rs 10,00,000. Conversion cost of Rs 15,00,000 were incurred upto the split-off point, at which time two saleable products were produced: Caustic soda and chlorine can be further processed into PVC. The April production and sales information are as follows:

	Production	Sales	Sales Price per Ton
Caustic Soda	1,200 tons	1,200 tons	Rs 1,250
Chlorine	800 tons		
PVC	500 tons	500 tons	Rs 5,000

All 800 tons of chlorine were further processed, at an incremental cost of Rs 5,00,000 to yield 500 tons of PVC. There were no byproducts or scrap from this further processing of chlorine. There were no beginning or ending inventories of caustic soda, chlorine or PVC in April.

There is an active market for chlorine. Inorganic Chemicals could have sold all its April production of chlorine at Rs 1,875 a ton.

Required:

- (i) Calculate, how the joint costs of Rs 25,00,000 would be allocated between Caustic soda and Chlorine under each of the following methods:
 - (1) sales value at split off
 - (2) physical measure (tons); and
 - (3) estimated net realizable value
- (ii) What is the gross margin percentage of Caustic soda and PVC under the three methods cited in requirement (i)?
- (iii) Lifetime Swimming Pool Products offer to purchase 800 tons of Chlorine in May, 2000 at Rs 1,875 a ton. This sale would mean that no PVC would be produced in May. How would accepting the offer affect May Operating Income? (C.A. Inter May 2000)

Solution

- (a) (i) **(1) Statement of Joint Costs Allocation between Caustic Soda and Chlorine by using Sales Value Method at Split Off**

Products	Caustic soda	Chlorine	Total
Sales value at split off (Rs)	15,00,000	15,00,000	30,00,000
	(1,200 tons × Rs 1,250)	(800 tons × Rs 1,250)	
Weightage	0.5	0.5	
Joint costs allocated (Rs)	12,50,000	12,50,000	25,00,000
	(Rs 25,00,000 × 0.5)	(Rs 25,00,000 × 0.5)	

- (2) Statement of Joint Costs Allocation between Caustic Soda and Chlorine by using Physical Measure (tons) Method**

Products	Caustic soda	Chlorine	Total
Physical measure (tons)	1,200	800	2,000
Weightage	0.6	0.4	
Joint costs allocated (Rs)	15,00,000	10,00,000	25,00,000
	(Rs 25,00,000 × 0.6)	(Rs 25,00,000 × 0.4)	

**(3) Statement of Joint Costs Allocation between Caustic Soda and Chlorine
by Using Estimated Net Realisable Value Method**

<i>Products</i>	<i>Caustic soda</i>	<i>Chlorine</i>	<i>Total</i>
Expected sales value of production (Rs)	15,00,000 (1,200 tons × Rs 1,250)	25,00,000 (500 tons × Rs 5,000)	40,00,000
Less: Further processing cost (Rs)	—	5,00,000	5,00,000
Estimated net realisable value at split off point (Rs)	15,00,000	20,00,000	35,00,000
Weightage	3/7	4/7	
Joint cost allocated (Rs)	10,71,429 $\left(\frac{3}{7} \times \text{Rs } 25,00,000\right)$	14,28,571 $\left(\frac{4}{7} \times \text{Rs } 25,00,000\right)$	25,00,000

**(ii) Statement of Gross Margin Percentage of Caustic soda and PVC under
Sales Value, Physical Measure and Estimated Net Realisable Value Methods**

	<i>Sales value (at split off)</i>	<i>Physical measure</i>	<i>Estimated net realisable value</i>
Caustic soda:			
Sales (Rs.)	15,00,000	15,00,000	15,00,000
Less: Joint costs allocated (Rs)	12,50,000	15,00,000	10,71,429
Gross margin (Rs)	2,50,000	0	4,28,571
Gross margin (in %)	16.67 $\left(\frac{\text{Rs } 2,50,000}{\text{Rs } 15,00,000} \times 100\right)$	0	28.57 $\left(\frac{\text{Rs } 4,28,571}{\text{Rs } 15,00,000} \times 100\right)$
PVC:			
Sales (Rs) (500 tons × Rs 5,000)	25,00,000	25,00,000	25,00,000
Less: Joint cost allocated (Rs)	12,50,000	10,00,000	14,28,571
Further processing cost (Rs)	5,00,000	5,00,000	5,00,000
Gross margin (Rs)	7,50,000	10,00,000	5,71,429
Gross margin (in %)	30 $\left(\frac{\text{Rs } 7,50,000}{\text{Rs } 25,00,000} \times 100\right)$	40 $\left(\frac{\text{Rs } 10,00,000}{\text{Rs } 25,00,000} \times 100\right)$	22.86 $\left(\frac{\text{Rs } 5,71,429}{\text{Rs } 25,00,000} \times 100\right)$

(iii) Incremental revenue from further processing of Chlorine into PVC

500 tons × Rs 5,000 – 800 tons × Rs 1,875: (A)	Rs 10,00,000
Incremental costs of further processing of chlorine into PVC: (B)	Rs 5,00,000
Incremental operating income from further processing: {(A) – (B)}	Rs 5,00,000

Decision: The operating income of Inorganic Chemicals which converts Chlorine into PVC after further processing will be reduced by Rs 5,00,000 in May, if it accepts the offer of Lifetime Swimming Pool Products, of selling to them 800 tons of Chlorine at Rs 1875 per ton.

THEORY QUESTIONS

- Discuss the distinguishing features of a process cost system?
- Compare the cost accumulation and summarising procedures of a job order cost system and a process cost system.
- What is equivalent production? What is its effect on computed unit cost?
- Discuss the possible effects on a department's unit costs when materials are added to work-in-progress.
- How is opening work-in-progress handled in average costing?
- What are some of the disadvantages of the FIFO costing method?
- What is the meaning of the term "split-off"? What is its significance in product costing?
- What are joint costs? What problems are created by joint costs?
- Explain the difference between a main product and a by-product.
- How can the income from the sale of by-products be shown on the income statement?
- Does the showing of income from by-products on the income statement influence the unit cost of the main product?
- What is the difference between physical quantity method and sales value method?
- Define and explain the term "joint products and by-products". Enumerate the method which may be employed in costing "joint product".
- Define joint products and by-products. Explain the various bases available for apportionment of joint costs to joint products.
(CA Inter)
- Explain with an example the concept of 'equivalent production' for valuation of work-in-progress.
(B. Com. (Hons), Delhi)
- What are the three most common methods of allocating joint product cost? Write a brief explanatory note on each.
(B. Com. (Hons), Delhi)
 - Explain the procedure of accounting for by-products.

SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple choice question:

- When should process costing method be used in assigning costs of products.
 - If the product is manufactured on the basis of each order received.
 - When production is only partially completed during the accounting period.
 - If the product is composed of mass-produced homogeneous units.
 - In situations in which standard costing techniques should not be used.
- Which of the following characteristics applies to process costing but not to job-order costing?
 - Identifiable batches of production
 - Equivalent units of production
 - Averaging process
 - Use of standard costs
- Which is the best cost accumulation procedure to use when there is a continuous mass production of like units.
 - Actual
 - Standard

- (c) Job order
(d) Process
- (iv) Which of the following is a characteristic of a process costing method?
(a) Work-in-progress inventory restated in terms of completed units
(b) Costs are accumulated by order
(c) It is used by a company manufacturing on customers' orders
(d) Standard costs are not applicable
- (v) Normal wastage and abnormal wastage should be classified as:
- | <i>Normal</i> | <i>Abnormal</i> |
|------------------|-----------------|
| (a) Period cost | Period cost |
| (b) Product cost | Period cost |
| (c) Period cost | Product cost |
| (d) Product cost | Product cost |
- (vi) Normal wastage is properly classified as:
(a) An extraordinary item
(b) Period cost
(c) Product cost
(d) Deferred charge
- (vii) If the amount of wastage in a manufacturing process is abnormal, it should be classified as:
(a) Deferred charge
(b) Joint cost
(c) Period cost
(d) Product cost
- (viii) The type of wastage that should not affect the recorded costs of closing inventories is:
(a) Abnormal wastage
(b) Normal wastage
(c) Seasonal wastage
(d) Standard wastage
- (ix) Each of the following is a method by which to allocate joint costs except
(a) Relative sales value
(b) Relative profitability
(c) Relative weight, volume
(d) Average unit cost
- (x) When two products are produced during a common process, what is the factor that determines whether the products are joint products or one principal product and a by-product?
(a) Potential marketability for each product
(b) Amount of work expended in the production of each product
(c) Relative total sales value
(d) Management policy
- (xi) Joint costs are most frequently allocated based upon relative
(a) Profitability
(b) Conversion costs
(c) Sales value
(d) Prime costs
- (xii) In order to compute equivalent units of production using FIFO method of process costing, work for the period must be broken down to units.
(a) Completed during the period and units in ending inventory.
(b) Completed from the beginning inventory, started and completed during the month and units in

- closing inventory.
- (c) Started during the period and units transferred out during the period.
- (d) Processed during the period and units completed during the period.
- (xiii) From the industries listed below, choose the one most likely to use process costing in accounting for production costs:
- Road builders
 - Electrical contractor
 - Newspaper publisher
 - Automobile repair shop

PROBLEMS

1. From the following figures, prepare process accounts indicating the cost of process and the total cost. The production was 480 articles per week.

	Process	Process II	Process III
Materials	Rs 3,000	Rs 1,000	Rs 400
Labour	1,600	4,000	1,200
Factory Overheads	520	1,440	500

Office overheads amounting to Rs 1,700 should be apportioned on the basis of wages. Ignore stock in hand and work-in-progress at the beginning and end of the week.

(B. Com. Delhi)

Ans: Process I — Transfer to Process I, Rs 5,520
 Process II — Transfer to Process II, Rs 12,960
 Process III — Transfer to finished stock Rs 15,360

2. Prepare process cost accounts from the following details:

	Process A	Process B
Materials	Rs 30,000	Rs 3,000
labour	10,000	12,000
Overheads	7,000	8,600
Input (Units)	20,000	17,500
Normal loss	10%	4%
Sale value wastage per unit	Rs 1 per unit	Rs 2 per unit

There was no opening or closing stock of any type. The final output from Process B was 17,000 units.

Prepare process cost accounts showing the calculations of abnormal loss or gain

Ans: Process A abnormal loss @ Rs 2.50 per unit; Process B abnormal gain @ Rs 3.925 per unit.

3. A product is obtained after passing it through three processes. The following information is collected for March, 2002:

	Process		
	I	II	III
Direct materials	Rs 5,200	Rs 3,960	Rs 5,924
Direct wages	Rs 4,000	Rs 6,000	Rs 8,000
Output in units			
during the month	950	840	750
Normal Loss (%)	5	10	15
Value of scap (per unit)	Rs 4	Rs 8	Rs 10

Additional information:

1,000 units at Rs 6 each was introduced in Process I. There was no stock of materials or work-in-process at the beginning or at the end of that month. The production overheads was Rs 18,000 for that month.

Prepare Process Accounts indicating normal loss, abnormal loss and abnormal gain.

Ans: No. I: Normal loss 50 units; No II: abnormal loss 15 units per unit; No. III: abnormal gain 36 units @ Rs 76 per unit. Production overhead apportioned in the ratio of wages.

4. The product of a company passes through three distinct processes of completion. From past experiences, it is ascertained that normal wastage in each process is as under:

Process	Wastage	Sale value of wastage
A	2%	25 paise per unit
B	4%	50 paise per unit
C	2.5%	60 paise per unit

The expenses were as follows:

	Process A	Process B	Process C
Materials	Rs 12,000	Rs 10,000	Rs 9,000
Direct labour	16,000	5,000	4,900
Manufacturing expenses	2,000	3,400	3,590
Other factory expenses	3,500	2,000	2,000

4,000 units were initially introduced in Process A at a cost of Rs 13,560.

The output of each process was as under:

Process	Output
A	3,850 units
B	3,600 units
C	3,500 units

Prepare process accounts and also work out the sale price per unit of finished stock so as to realise 20% profit on selling price. (CA Inter)

5. In a process engineering factory, a product has to pass through three distinct processes before it is ready for sale. From the information appended below, work out the selling price of the product if the management decides to have a mark-up of 25% over its works cost.

	I	II	III
1. Stages of production			
2. Input of raw materials at Rs 4 per kg	1,00,000		
3. Normal loss on input of each stage	5%	5%	5%
4. Delivered to next process (kg)	90,000	80,000	—
5. Total direct labour cost (Rs)	14,000	15,000	30,000
6. Variable overheads % on direct labour	150%	120%	100%
7. Fixed overheads % on direct labour	250%	140%	200%
8. Finished stocks held back at the stage	4,000	4,000	—

For the purpose of this exercise, abnormal loss, if any, may be charged to the respective stages since output of each stage can also be diverted to other processes for manufacture of other chemicals. (ICWA Inter)

Ans:

	Process		
	I	II	III
Closing stock	20	24	600
Normal loss	5 kg	4.5 kg	4 kg
Abnormal loss	1 kg	1.5 kg	—

6. Department I of Coromandel Chemicals conducts a process which requires mixing of materials and cooking of the mixture in batches of 1,000 lbs each. Cooking results in 10 per cent loss of weight of the mixture. Also, past experience shows that two batches out of every ten started in the process are spoiled. The production records for May, 2002 show the following:

- Production started in the Process: 50 batches of 1,000 lbs each.
- Production completed and transferred to finished goods: 34,200 lbs.

- (iii) There is no inventory of work-in-process at the beginning or at the end of the month. Costs recorded during the month totalled Rs 45,000. Prepare the account of the process conducted by Department I. (B. Com. (Hons), Delhi)

Ans: Abnormal loss 800 lbs, Rs 1,029

Finished goods 34,200 lbs, Rs 43,971

7. A product passes through three processes, A, B and C. 10,000 units at a cost of Re 1 were issued to Process A. The other direct expenses were:

	Process A	Process B	Process C
Sundry materials	1,000	1,500	1,480
Direct labour	5,000	8,000	6,500
Direct expenses	1,050	1,188	1,605

The wastage of Process A was 5% and Process B 4%. The wastage of Process A was sold at Re 0.25 per unit and that of B at Re 0.50 per unit and that of C at Re 1.00 per unit. The overhead charges were 160% of direct labour. The final product was sold at Rs 10.00 per unit, fetching a profit of 20% on sales. Find the percentage of wastage in Process C. (B. Com. Delhi)

	Units	Amount
Ans:		
Process A	9,500	25,325
Process B	9,120	49,263
Process C (Sales)	8,664	86,640

Hint: Percentage of wastage in Process C

Assume No. of waste units is X

Sales value of waste units = $X \times \text{Re } 1 = \text{Rs } X$

Total cost = Rs 69,768 - X

$$\begin{aligned} \text{Or Total cost} &= \text{Cost per unit} \times \text{No. of units produced} \\ &= \text{Rs } 8 \text{ (i.e. Rs } 10 - \text{Rs } 2) \times (9,120 - X) \\ &= 8 \times (9,120 - X) \\ &= 72,960 - 8X \end{aligned}$$

$$\begin{aligned} \text{Thus, } 69,768 - X &= 72,960 - 8X \\ 8X - X &= 72,960 - 69,768 \\ 7X &= 3,192 \\ X &= 456 \end{aligned}$$

$$\begin{aligned} \text{Percentage of wastage} &= \frac{456}{9120} \times 100 \\ &= 5\% \end{aligned}$$

8. A Re-roller produced 400 metric tons of M.S. Bars spending Rs 1,80,000 towards materials and Rs 60,000 towards rolling charges. 10% of the output was found defective which had to be sold at 10% less than the price for good ones. If the sales realisation should give him an overall profit of $12\frac{1}{2}\%$ on cost, find the selling price per metric ton of both the categories of bars. The scrap arising fetched a realisation of Rs 3,000. (ICWA Inter)

Ans: Hint:

Materials	Rs 1,80,000
Rolling charges	60,000
	<hr/>
	2,40,000

	Less: Scrap value	3,000
	Total cost	2,37,000
	Add profit at 12 1/2 on cost	29,625
	Sales realisation required	2,66,625
	Production	400 metric tons
Less:	10% defective production	40 metric tons
	Good production	360 metric tons
	Defective production equivalent to good production, i.e.	
	40 metric tons	
	at 90% price for good ones	36 metric tons
	Equivalent good production	396 metric tons
	Selling price per metric tons of good production	= $\frac{2,66,625}{396}$

= Rs 673.30

Selling price per metric ton of defective production = (673.30) – 10% of 673.30 = Rs 605.97

Verification:

Sales realisation of 360 metric tons of good production	= 360 × 673.30 =	$\frac{2,42,2388}{2,66,627}$
Sales realisation of 40 metric tons of defective production	= 40 × 605.97 =	$\frac{24,239}{2,66,627}$
Total sales realisation		$\frac{2,66,627}{2,66,627}$

The above sale realisation will give him an overall profit of $12\frac{1}{2}$ % of cost.

9. Product Z is obtained after it passes through three distinct processes. The following information is obtained from the accounts for the month ending December 31, 2002.

Items	Total Rs	Process		
		Rs	Rs	Rs
Direct material	7,542	2,600	1,980	2,962
Direct wages	9,000	2,000	3,000	4,000
Production overhead	9,000			

1,000 units at Rs 3 each were introduced to Process I. There was no stock, material or work-in-progress at the beginning or end of the period. The output of each process passes direct to the next process and finally to finished stores. Production overhead is recovered at 100% of direct wages. The following additional data are obtained:

Process	Output during the month	Percentage of normal loss to input	Value of scrap per unit
Process I	950	5%	Rs 2
Process II	840	10%	4
Process III	750	15%	5

Prepare the process cost accounts and abnormal gain or loss accounts.

(B. Com. (Hons), Delhi)

Ans: Process I 950 units Rs 9,500
 II 840 units Rs 16,800
 III 750 units Rs 28,500

Abnormal loss Process II—15 units Rs 300

Abnormal gain Process III—36 units, Rs 1,368

10. Product X is obtained after it is processed through three distinct processes. The following cost information is available for this operation.

Rs	Total Rs	Process		
		I Rs	II Rs	III
Materials	5,625	2,600	2,000	1,025
Direct wages	7,330	2,250	3,680	1,400
Production overheads	7,330	—	—	—

500 units @ Rs 4 per unit were introduced in Process I. Production Overheads are absorbed as a percentage of Direct Wages.

The actual output and normal loss of the respective processes are:

	Output unit	Normal loss on input	Value of scrap per unit Rs
Process I	450	10%	2
Process II	340	20%	4
Process III	270	25%	5

There is no stock or work-in-progress in any process.

Show:

- (i) the three process accounts
 (ii) the abnormal loss and abnormal gain accounts.

(ICWA Inter)

Ans: Process I — Transfer to Process II 450 units Rs 9,000
 Process II — Abnormal loss 20 units Rs 1,000. Transfer to Process III 340 units Rs 17,000.
 Process III— Abnormal gain 15 units Rs 1,200. Transfer to finished stock 270 units Rs 21,600.

11. 'No' Friction is an industrial lubricant which is formed by subjecting certain crude chemicals to two successive processes. The output of Process I is passed to Process II where it is blended with other chemicals. The process costs for period 3 were as follows:

Process I

Material 3,000 kg @ Re 0.25 per kg
 Labour Rs 120
 Process plant time 12 hours @ Rs 20 per hour

Process II

Material 2,000 kg @ Re 0.40 per kg
 Labour Rs 84
 Process plant time 20 hours @ Rs 13.50 per hour

General overhead for period 3 amounted to Rs 357 and is absorbed into process costs on a process labour basis. The normal output of Process I is 80% of input and of Process II, 90% of input. Waste matter from Process I is sold for Re 0.20 per kg and that from process II for Re 0.30 per kg.

The output for period 3 was as follows:

Process I 2,300 kg
 Process II 4,000 kg

There was no stock or work in progress at either the beginning or the end of the period and it may be assumed that all available waste matter had been sold at the prices indicated.

You are required to show how the foregoing data would be recorded in a system of cost accounts.

Ans: Process I A/c	—Transfer to process II, 2,300 kg Rs 1,150
	Normal loss 600 kg Rs 120
	Abnormal loss 100 kg Rs 50
	—Cost per unit Re 0.50
Process II A/c	—Transfer to finished stock 4,000 kg Rs 2,400
	Normal loss 430 kg Rs 129
	Abnormal gain 130 kg Rs 78
	Cost per unit Re 0.60
Abnormal loss A/c	—Transfer to P and L A/c Rs 30
Abnormal gain A/c	—Transfer to P and L A/c Rs 39
	Normal loss A/c

	Rs		Rs
To Process I	120	By Abnormal gain A/c	Rs 39
To Process II	129	By Balance or cash received	230
To Abnormal loss A/c	20		
	<u>269</u>		<u>269</u>

12. The Product X is processed by passing the chemical C through four processes where the output of the earlier process become the input of the subsequent process. The loss of materials expressed as percentage of input is as follows:

Process I: 20%, II: 10%, III: 16-2/3%, IV: 8-1/3. The material lost in each process does not have any resale value.

Calculate: (a) The cost per kg of Product X if the cost of chemical 'C' is Rs 8 per kg and (b) The capacity of the process plant for processes I, II, III and IV to hold the material for process expressed in metric tonnes of input for each process:

If two conditions are to be fulfilled, viz. (i) 20% of the space is to be allowed for chemical reactions, and (ii) the output of Product X from the final process (Process IV) is expected to be 5 metric tonnes.

(ICWA Inter)

Ans: Rs 14.56, Capacity Process	I	- 10.91 tons
	II	- 8.73 tons
	III	- 7.86 tons
	IV	- 6.54 tons

13. The finished product of a factory has to pass through three processes A, B and C. The normal wastage of each process is 2% in A, 5% in B and 10% in C. The percentage of waste is computed on the number of units entering each process.

The scrap value of wastage of process A, B and C are Rs 10, Rs 40, Rs 20 per 100 units respectively.

The output of each process is transferred to the next process and the finished products are transferred from Process C into stock. The following further information is obtained:

	Processes		
	A	B	C
	Rs	Rs	Rs
Materials consumed	12,000	4,000	4,000
Direct labour	8,000	6,000	6,000
Manufacturing expenses	2,000	4,000	2,000

2,000 units were put into process A at a cost of Rs 16,000. The output of each process has been A-19,600 units, B-18,400 units and C-16,700 units.

There was no stock of work-in-progress in any process.

Prepare the process accounts.

(B. Com. (Hons), Delhi)

Ans: Process A, units 19,600 Rs 37,960 Rs 609

Process B, units 18,400 Rs 50,959, Abnormal loss (Process B) 220 units, Rs 609

Process C, finished goods units 16,700 Rs 63,120 Abnormal gain Process C 140 units Rs 529

14. XYZ Ltd. manufactures and sells three chemicals produced by consecutive processes known as X, Y and Z. In each process, 2% of the total weight put in is lost and 10% is scrap, which from processes X and Y realised Rs 100 a tonne and from Z Rs 200 a tonne. The products of the three processes are dealt with as follows:

	X	Y	Z
Sent to warehouse for sale	25%	—	100%
Passed on to next process	75%	100%	—
The following particulars relate to the month of March:			
Materials used (Tonnes)	100	140	1,348
Cost per tonne of materials (Rs)	120	200	80
Manufacturing expenses (Rs)	30,800	25,760	1,810

Prepare an account of each process, showing the cost per tonne of each process.

(B. Com. (Hons) Delhi)

15. The product of a manufacturing concern passes through two processes A and B and then to finished stock. It is ascertained that in each process 5% of the total weight is lost and 10% is scrap, which from processes A and B realises Rs 80 per tonne and Rs 200 per tonne, respectively.

The following are the figures relating to both the processes:

	Process A	Process B
Materials (tonnes)	1,000	70
Cost of materials (Rs per tonnes)	125	200
Wages (Rs)	28,000	10,000
Manufacturing expenses (Rs)	8,000	5,250
Output (tonnes)	830	780

Prepare the process cost account showing cost per tonne of each process. There was no stock or work-in-process in any process.

(B. Com. (Hons), Delhi)

16. XYZ Ltd. manufactures and sells three chemicals produced by consecutive processes known as X, Y and Z. In each process, 2% of the total weight put in is lost and 10% is scrap, which from processes X and Y realised Rs 100 a tonne and from Z Rs 200 a tonne. The products of the three processes are dealt with as follows:

	X	Y	Z
Sent to warehouse for sale	25%	—	100%
Passed on to next process	75%	100%	—
The following particulars relate to the month of March:			
Materials used (Tonnes)	100	140	1,348
Cost per tonne of materials (Rs)	120	200	80
Manufacturing expenses (Rs)	30,800	25,760	1,810

Prepare an account of each process, showing the cost per tonne of each process.

(B. Com. (Hons), Delhi)

17. A Product passes through three processes. Figure relating to production for the 6 months of 2002 are as follows:

	Process I	Process II	Process III
Raw materials used	1,000 tons		
Cost per tonne	Rs 200		
Manufacturing wages and expenses	Rs 72,500	Rs 40,800	Rs 10,710
Weight lost	5%	10%	20%
Scrap-sold at Rs 50 per tonne	50 tonnes	30 tonnes	51 tonnes
Sales price per tonne	Rs 350	Rs 500	Rs 800

Management expenses were Rs 17,500, selling expenses Rs 10,000 and interest on borrowed capital Rs 4,000.

Two thirds of Process I and one-half of Process II are passed on to the next process and the balances are sold.

You are required to prepare process cost accounts in a form suitable for presentation to the directors at their next board meeting when the production policy of the company will be discussed.

(B. Com. (Hons), Delhi)

18. X Ltd. produces a chemical, which requires processing in 3 departments. In the second department materials are added doubling the number of units. The following information relate to the operations of Department No. 2 for the month of September:

Units received from department No. 1	10,000
Units transferred to department No. 3	16,000

The balance of the units were still in process, 100% complete as to material and 50% complete as to labour and overhead.

Cost transferred from department No. 1	1,20,000
Cost added by the department:	
Materials	35,200
Labours	36,000
Factory overhead	28,800

Prepare a cost of production statement for department No. 2 for September.

Ans: Cost of Production for Deptt. 2 Units 16,000 Rs 1,81,760, cost of work-in-progress Rs 38,240. Units in W.I.P. 4,000.

19. Units put into process 2,500
 Units completed 2,000
 Work-in-progress at close 500

Process costs:

Materials	Rs 22,500
Labour	6,750
Overhead	2,250

Work-in-progress is completed 40% as to materials, labour and overhead. Find out the,

- Equivalent production
- Cost per unit of equivalent production, and
- Process account

Ans: Equivalent unit: Materials, labour and overhead 2,200 units each; Materials Rs 10.227, labour Rs 3.068, overhead Rs 1.022

20. AB Ltd., is engaged in Process Engineering industry. During the month of April, 2002, 2,000 units were introduced in Process X. The normal loss was estimated at 5% of input. At the end of the month 1,400 units had been produced and transferred to Process Y, 460 units were incomplete and 140 units, after passing fully through the entire process, had to be scrapped. The incomplete units had reached the following stage

of completion:

Material	75% completed
Labour	50% completed
Overhead	50% completed

Following are the further information on the Process X:

Cost of the 2,000 units	Rs 58,000
Additional direct materials	14,400
Direct labour	33,400
Overheads	16,700
Units scrapped realised Rs 10 each	

Prepare statement of equivalent production, statement of cost, statement of evaluation and the Process X Account. *(ICWA Inter, June)*

Ans: Equivalent units: Materials 1,785, labour and overheads 1,670 units each; Cost per unit: Materials Rs 40, labour Rs 20, overheads Rs 10.

21. A company operates a department producing a component which passes through two processes. During November, materials for 40,000 components were put into process. There was no opening process stock. 30,000 components were finished and passed to the next process. Those not passed forward were calculated to be half finished as regards wages and overhead. The cost incurred were as follows:

Direct material	Rs 10,000
Factory overhead	12,000
Direct wages	8,000

Of those passed to the second process, 28,000 were completed and passed to finished stores; 200 were scrapped, which was not abnormal; 1,800 remained unfinished in process, one quarter finished as regards wages and overhead. No further process material costs occur after introduction at the first process, until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the second process were as follows:

Direct material	Rs 4,000
Factory overhead	4,500
Direct wages	3,500

Prepare a cost analysis statement for November, accounting for total costs incurred, analysed into elements of cost for each process, covering finished and part-finished items.

22. From the following details prepare statement of equivalent production, statement of cost and find the value of

- (a) Output transferred, and
(b) Closing work-in-progress applying average method of valuation of process stock.

Opening work-in-progress	2,000 units
Materials (100% complete)	Rs 7,500
Labour (60% complete)	3,000
Overheads (60% complete)	1,500
Units introduced into this process	8,000

There are 2,000 units in process and the state of completion is estimated to be:

Materials	100%
Labour	50%
Overheads	50%

8,000 units are transferred to next process.

The process costs for the period are:

Materials	Rs 1,00,000
Labour	78,000

Overhead 39,000

Ans: Equivalent units: Materials 10,000, labour and overheads 9,000 each: (a) Rs 1,99,784, (b) Rs 35,723

23. The following figures relate to a single industrial process:

Quantity of work-in-process at commencement 8,000 units.

Costs of work-in-process at commencement:

Material	Rs 29,600
Wages	6,600
Overhead	5,800

During the period under review, a further 32,000 units were introduced and the additional costs were: Material Rs 1,12,400, Wages Rs 33,400, Overhead Rs 30,200. At the end of the period 28,000 units were fully processed and 12,000 units remained in process. This closing stock was complete as regards material cost and one-third complete as regards wages and overhead.

Using the average method of valuation, tabulate these production and cost figures to give quantities, unit values, and total values for completed output and for each of the three elements comprising the closing work-in-process.

Ans: Equivalent units: Materials 40,000, labour and overhead 32,000 units each; Cost per unit: materials Rs 3.55, labour Rs 1.25, overhead Rs 1.125; Cost of completed output Rs 1,65,900; cost of work-in-process Rs 52,100.

24. Product A passes through three processes. In January, 2002, the following information is obtained in respect of Process II.

Opening stock: 2,800 units valued at Rs 1,200 made up of
Rs 700 for material
Rs 150 for labour
Rs 350 for overheads

Transfer from Process I: 14,000 units at Re. 0.20 each.

Transfer to Process III: 12,000 units.

Direct material added in Process II Rs 1,560

Direct labour amounted to 2,000

Production overhead incurred 4,400

Units scrapped: 2,000 on completion of Process II.

Closing stock: 2,800 units.

Degree of completion:	Material	80%
	Labour	60%
	Overheads	60%

25. XYZ Company has a single process:

Work-in-process (opening) 8,000 units

Cost: Materials Rs 29,600

Wages Rs 6,600

Overhead Rs 5,800

During the period the input was 32,000 units. Additional costs were: material Rs 1,12,400; wages Rs 33,400, overhead Rs 30,200.

At the end of the year 28,000 units were fully processed and 12,000 units were in process. The value of the closing stock includes the full cost of materials and only one-third of the cost of wages and overheads.

Tabulate the production and cost figures to give quantities, unit values, total value of completed output and detailed values for the closing work-in-process.

Ans: Completed output Rs 1,65,900

Incomplete units 52,100

26. GH and Co. manufactures a product in one process. Process costing is followed and work-in-process stocks at the end of each month are valued on a FIFO basis.
At the beginning of the month June 2002, the inventory of work-in-process showed 400 units, 40% complete, valued as follows:

	Rs
Materials	3,600
Labour	3,400
Overhead	1,000
Total	8,000

In the month of June, materials were purchased for Rs 75,000. Wages and overhead in the month amounted to Rs 79,800 and Rs 21,280 respectively. Actual issue of materials to production was Rs 68,500. Finished stock in the month was 2,500 units. There was no loss in process.

At the end of the month the work-in-process inventory was 500 units, 60% complete as to labour and overheads and 80% complete as to materials.

Prepare a statement of equivalent production, statement of cost and process account.

Ans: Value of finished stock Rs 1,56,095

Value of work-in-process Rs 21,485

27. The following details relate to an intermediary process in a factory:

	% Degree of completion	No. of units	Cost Rs
Opening work-in-progress:		300	12,300
(a) Materials	50%		
(b) Labour	80%		
(c) Overheads	80%		
Transfer from previous process	100%	3,800	1,36,800
Process material added			7,900
Direct wages			37,400
Overheads			14,960
Transfer to next progress (finished)	100%	3,500	
Closing work-in-progress:		600	
(a) Material	100%		
(b) Labour	80%		
(c) Overheads	80%		

Prepare:

- (a) Process cost accounts for the intermediary process.
- (b) Statement of equivalent units (on FIFO basis).
- (c) Statement of distribution of cost on the basis of equivalent units.

Ans: Transfer to next process 3,500 units Rs 1,79,840

Closing stock 600 units Rs 29,520

28. From the following details prepare a statement of equivalent production, statement of cost and find the value of:

- (a) Output transferred, and
- (b) Closing work-in-progress.

Opening work-in-process: 2,000 units

The cost are:

Materials (100% complete)

Rs
7,500

Labour (60% complete)		3,000
Overhead (60% complete)		1,500
Units introduced into this process	8,000	

There are 2,000 units in process and the stage of completion is estimated to be:

Material	100%
Labour	50%
Overheads	50%

8,000 units are transferred to the next process.

The process costs for the period are:

	Rs	
Material	1,00,000	
Labour	78,000	
Overhead	39,000	(CA Inter)

Ans: Cost of output transferred Rs 1,89,000 cost of closing W.I.P. Rs 40,000.

29. Process 2 receives units from Process 1 and after carrying out work on the units transfers them to process 3.

For the accounting period the relevant data were as follows:

Opening WIP 200 units (25% complete) valued at	Rs 5,000
800 units received from Process 1 valued at	Rs 8,600
840 units were transferred to Process 3	
Closing WIP 160 units (50% complete)	

The costs of the period were Rs 33,160 and no units were scrapped.

Required:

Prepare the Process Account for Process 2 using the Average Cost Method of valuation.

(C.A. Inter Nov. 1995)

Ans: Average cost per complete unit Rs 50.826
cost of production

840 complete units	Rs 42,694
160 WIP units	Rs 4066

30. The following details are given in respect of a manufacturing unit for the month of April 1995:

- (i) Opening work-in-progress 5,000 units

	Rs
(a) Materials (100% complete)	18,750
(b) Labour (60% complete)	7,500
(c) Overheads (60% complete)	3,750

- (ii) Units introduced into the process 17,500 units
(iii) 17,500 units are transferred to the next process
(iv) Process cost for the period are

Material	Rs 2,50,000
Labour	Rs 1,95,000
Overheads	Rs 97,500

- (v) The stage of completion of units in closing WIP are estimated to be: Material 100%, Labour 50% and Overheads 50%.

You are required to prepare a statement of equivalent unit of production, statement of cost. Also find the value of

- (i) Output transferred
(ii) Closing work-in-progress, using average cost method.

(C.A. Inter June 1995)

Ans: Average cost per equivalent unit Rs 27.132 value of output transferred Rs 474810 value of closing WIP Rs 97,690

31. The finished product of a factory passes through two processes, the entire material being placed in process at the beginning of the first process. From the following production and cost data relating to the first process, work out the value of the closing inventory and the value of the materials transferred to the second process.

<i>Process I</i>	Rs	
Opening inventory	10,000	
Material	27,500	
Labour	50,000	
Manufacturing overheads	40,000	
		kg
Opening inventory (25% complete)		4,000
Put into process		12,000
Transferred to Process I		10,000
Closing inventory (20% complete)		5,000
Spoilage during process		1,000

Ans:

Opening stock	Rs 35,250
Completed output	RS 70,500
Closing inventory	Rs 11,750

32. The data given below relates to the month of January and February 2001 in a department of a factory owned by M/s Rockwel Products Ltd. which manufactures certain chemicals by a continuous process.

You are required to calculate for the department for each month using the present basis of average costs,

- (i) the profit made;
- (ii) the value of closing work-in-progress.

Data:

For January 2001

<i>Opening work-in-progress 200 units</i>	<i>Degree of completion</i>	<i>Rs</i>
Direct materials	100%	231.40
Conversion cost	40%	93.10
<i>Inputs 1400 Units</i>		
Direct materials		2,126.60
Conversion cost		2,742.90
Output passed by inspection	1,345 units	
Closing work-in-progress	220 units	
	<i>Degree of completion</i>	
Direct materials	100%	
Conversion cost	30%	

For February 2001

<i>Inputs 1550 Units</i>		<i>Rs</i>
Direct materials		2,452.40
Conversion cost		3,385.80
Output passed by inspection	1,555 units	
Closing work-in-progress	190 units	
	<i>Degree of completion</i>	
Direct materials	100%	
Conversion	20%	

Normal wastage is budgeted at 2% of the physical input of materials and is regarded as comprising units on which both direct labour and full conversion costs have been expended.

The department is credited at Rs 4 per unit with output passed by the inspection department.

Ans: Profit January Rs 644.90
February Rs 311.15

33. SM Ltd. furnishes you the following information relating to Process B for the month of October 2002.

(i) Opening work-in-progress	Nil
(ii) Units introduced	10,000 units @ Rs 3 per unit
(iii) Expenses debited to the process:	
	Rs
Direct materials	14,650
Labour	21,148
Overheads	42,000
(iv) Normal loss in process—1% of input	
(v) Closing work-in-progress—350 units	
Degree of completion:	
Material	100%
Labour and overheads	50%
(vi) Finished output 9,500 units	
(vii) Degree of completion of abnormal loss:	
Material	100%
Labour and overheads	80%
(viii) Units scrapped as normal loss were sold at Re. 1 per unit.	
(ix) All the units of abnormal loss were sold at Rs 2.50 per unit.	

Prepare:

- Statement of equivalent production
- Statement of cost
- Process B account
- Abnormal loss account

(CA Inter)

Ans: Finished goods units 9,500
Cost Rs 1,04,500

34. The following information has been extracted from the records of a manufacturing company for the month of January 2002 relating to Process II. Prepare a statement of equivalent production, statement of cost and process account.

	Units	Amount
Opening work-in-progress	400	5,150
Transfer from Process I	10,600	82,300
Transfer to Process III	9,600	—
Closing work-in-progress	1,000	—
Units scrapped	400	—
Direct materials added	—	39,520
Direct wages		19,520
Overhead		9,760
Degree of completion:	Opening stock	Closing stock
Material	80%	70%
Labour	60%	50%
Overhead	60%	50%

A normal loss of 5% occurred during the period. Scrap was sold at Rs 3 per unit.

Ans: Abnormal gain 100 units
Equivalent production cost per unit Rs 15 (Total).

Apportionment of Cost

Opening W.I.P. Rs 800, Closing W.I.P. Rs 12,300, introduced and completed during the period Rs 1,38,000, Abnormal gain Rs 1,500. Cost of output transferred to Process III Rs 1,43,950. FIFO has been assumed.

Inter Process Profit

35. The manufacturing operations of J.K. Ltd. involve three distinct processes in connection with the same unit. The output of Process *P* is charged to Process *Q* at a profit of 25% on cost, and the output of Process *Q* is charged to Process *R* on similar basis. The completed product is transferred into stock at a price which gives Process *R* a profit of 25% on transfer price. From the following particulars prepare process cost accounts and finished goods account. Stock in each process has been valued at prime cost.

Process	<i>P</i>	<i>Q</i>	<i>R</i>
Materials consumed	Rs 14,000	Rs 21,000	Rs 7,000
Labour	21,000	14,000	28,000
Closing stock	7,000	14,000	21,000

Sales Rs 1,26,000.

Closing stock of finished products amount to Rs 14,000. Show also the actual realised profit to be taken to the credit of the Profit and Loss Account.

Ans: Profit, Process *P* Rs 7,000, Process *Q* Rs 14,000, Process *R* Rs 28,000, Finished stock A/c Rs 28,000, Actual realised profit Rs 66,220, cost of closing stock:

Process *Q* Rs 12,600, Process *R* Rs 17,080, Finished stock Rs 8,540.

36. Cheap Sweets Ltd. has divided its manufacture into two processes, *A* and *B*. After leaving process *B*, the product is passed into finished stock. The output of Process *A* is transferred to Process *B* at a price which gives process *A* a profit of 25% there on, and the output of Process *B* is transferred to finished goods at a price which gives Process *B* a profit of 20% there on.

The following information is provided in respect of the year ended 31st December, 2002:

	Process <i>A</i>	Process <i>B</i>
Stock on 1st January, 2002	Rs 3,200	2,000
Materials used	6,400	2,700
Direct labour	12,500	8,500
Overheads	2,500	1,700
Stock on 31st December, 2002	2,100	900

Process stocks consist of products which have passed through the process completely and are valued at prime cost to the process concerned.

Finished goods were in stock on 1st January, 2002 to the value of Rs 10,200 and on 31st December, 2002 to the value of Rs 6,200. Both the opening and closing stocks were valued at the price at which they were transferred from Process *B*.

Sales amounting to Rs 68,400 were effected during the year and included all the goods in stock at the beginning of the year.

The reserves on 1st January, 2002 for unrealised profit included in stock valuation were: Process *B*—350; Finished goods Rs 3,430.

Prepare the Process Accounts, Finished Goods Account and Trading Account for the year ended 31st December, 2002.

Ans: Profit Process *A* Rs 7,500, Process *B* Rs 11,000. Finished goods stock A/c Rs 9,400. Trading A/c Profit Rs 29,413.

37. Product *A* passes through three processes before it is transferred to finished stock. The following information is obtained for the month of July:

	Process <i>I</i>	Process <i>II</i>	Process <i>III</i>	Finished stocks
	Rs	Rs	Rs	Rs
Opening stock	5,000	8,000	10,000	20,000
Direct materials	40,000	12,000	15,000	—
Direct wages	35,000	40,000	35,000	—
Manufacturing overhead	20,000	24,000	20,000	—
Closing stock	10,000	4,000	15,000	30,000
Profit % on transfer price to next process	25%	20%	10%	—
Inter-process profit for opening stock	—	1,395	2,690	6,534

Stocks in processes are valued at prime cost and finished stock has been valued at the price at which it is received from Process III. Sales during the period were Rs 4,00,000.

Prepare and compute:

- Process cost accounts showing profit element at each stage.
- Actual realised profit, and
- Stock valuation for balance sheet purpose.

Ans: Profit Process I Rs 30,000, Process II Rs 50,000, Process III Rs 35,000, Finished goods stock Rs 60,000 Actual realised profit:

Process I	Rs 30,000
Process II	Rs 50,697
Process III	Rs 33,655
Finished stock	Rs 56,732

Stock valuation for balance sheet =	Process I	Rs 10,000
	Process II	Rs 3,302
	Process III	Rs 10,965
	Finished	Rs 20,198
	Total:	Rs 44,465

38. A manufacturing company has two processes, Process *A* and Process *B*. Raw material is introduced in Process *A* and the entire output thereof is transferred to Process *B* at cost plus 10%. Process *B* involves conversion cost only after which the product is sold. There is no inventory of finished goods at the end of any year. You are given the following data in respect of a year:

	Process <i>A</i>	Process <i>B</i>
Work-in-progress (opening)	4 tonnes	2 tonnes
Material (cost/transfer price) (Rs)	60,000	49,500
Labour and overheads (40% complete) (Rs)	20,000	10,500
During the year the following costs were incurred:		
Raw material consumed at cost (50 tonnes)	8,00,000	—
Work-in-progress (closing)		
Material	5 tonnes	1 tonne
Labour and overheads	50% complete	50% complete

No further costs are involved, no process loss is involved. All finished goods are sold at Rs 50,000 per tonne. You are required to:

- Prepare Process Cost Sheets on FIFO Basis.
- Show the profit earned for the period.
- Show all workings clearly.

Ans: Cost of goods produced Process A Rs 14,01,400, Process B Rs 19,24,800, Profit Rs 5,71,100.

Joint Products and By-Products

39. Hyderabad Chemical Company Ltd., manufactures a particular brand of phenyl. The phenyl passes through three important processes. During the month of January, 2001, 600 gross of bottles were produced. The cost books show the following information.

	Process A	Process B	Process C
Materials	Rs 8,000	4,000	3,000
Mabour	6,000	5,000	5,000
Direct expenses	1,200	400	1,000
Cost of bottles	—	4,060	—
Cost of corks	—	—	650

The indirect expenses for this period were Rs 3,200. The by-products of Process B were sold for Rs 480 and the residue of Process C was sold for Rs 250. Prepare the process accounts, find out the cost of production in each process and the cost of finished product per gross of bottles.

(B. Com. Delhi)

Ans: Finished goods stock Rs 40,780

Indirect expenses should be apportioned as a percentage of labour cost.

40. The following details are available from the books of a factory in which two processes are employed:

	Process	
	A	B
Materials	1,000 tonnes at Rs 50 per tonne	
Wages	3,000	Rs 20,025
Factory overheads	50% of wages	30% of wages
Wastage	10%	20%
Scrap	10%	10%
Scrap sold	Rs 8 per tonne	Rs 10 per tonne
By-products	200 tonnes sold at cost plus 20%	100 tonnes sold at cost plus 25%

Prepare process accounts and by-products accounts and show the cost per tonne at the end of each process and the selling price of by-products per tonne.

Ans: Finished goods 320 tonnes, Amount Rs 50057

Process A By-product Profit Rs 2,685

Process B By-product Profit Rs 3,911

41. Calculate the estimated cost of production of by-products X and Y at the point of separation from the main product.

	By-product X	By-product Y
Selling price per unit	Rs 12	Rs 24
Cost per unit after separation from the main product units produced	Rs 3	Rs 5
Units produced	500	200

Selling expenses amount to 25% of total works cost, i.e. including both pre-separation and post-separation work cost.

Selling prices are arrived at by adding 20% of total cost, i.e., the sum of works cost and selling expenses.

Ans: Total cost By-product X Rs 2500, By-product Y Rs 2200

Cost per unit X Rs 5, Y Rs 11

42. From the following information, find the profit made by each product apportioning joint costs on sales-value basis.

Joint costs:

Direct material	Rs 1,26,000	
Power	25,000	
Petrol, oil lubricants	5,000	
Labour	7,500	
Other charges	4,100	
	<i>Product X</i>	<i>Product Y</i>
Selling costs	Rs 20,000	Rs 80,000
Sales	1,52,000	1,68,000

(ICWA Inter)

Ans:

	<i>Product X</i>	<i>Product Y</i>
Total costs (Rs)	9,91,000	1,67,990
Profit (Rs)	52,390	10

43. From the following particulars, find out the cost of joint products A, B and C under Average Unit Cost Method:

(a) Pre-separation joint costs:	Rs 30,000
(b) Other production data:	

<i>Product</i>	<i>Units produced</i>	<i>Raw materials used (Units)</i>
A	1,000	4,000
B	400	8,000
C	600	8,000
Total	<u>2,000</u>	<u>20,000</u>

Ans:

Total Costs (Rs)	
Product A	15,000
Product B	6,000
Product C	9,000

44. A vegetable oil refining company obtains four products whose cost details are:

Joint costs of the four products: Rs 8,29,600

Outputs: A 5,00,000 litres, B 10,000 litres, C 5,000 litres, and D 9,000 kg.

Further Processing Costs: A Rs 2,40,000, B Rs 48,000, C Rs Nil, and D Rs 8,030.

The products can be sold as intermediates, i.e., at split-off point without further processing. The sale prices are:

	<i>As finished product</i>	<i>As intermediate</i>
A Rs per litre	1.84	1.20
B Rs per litre	8.00	4.00
C Rs per litre	6.40	6.40
D Rs per kg	26.67	24.00

- (a) Calculate the product-wise profit allocating joint costs on net realisable values.
 (b) Compare the profitability in selling the products with and without further processing.

Ans: (a) Profit Product A Rs 39,459, Product B Rs 2,631, Product C Rs 2,105, Product D Rs 14,205

(b) Profit with further processing A Rs 1,19,452, B loss 5,369, D Rs 30,205.

Profit with not further processing A 39,459 B Rs 2,631, D Rs 14,205

It is beneficial to further process Products A and D but not Product B.

45. In the course of manufacture of the main Product P, by-products A and B also emerge. The joint expenses of manufacture amount to Rs 1,19,550. All the three products are processed further after separation and sold as per details given below:

	Main product P	By-products	
	Rs	A	B
Sales	90,000	60,000	40,000
Cost incurred after separation	6,000	5,000	4,000
Profit as percentage on sales	25	20	15

Total fixed selling expenses are 10% of total cost of sales which are apportioned to the three products in the ratio of 20 : 40 : 40.

- (i) Prepare a statement showing the apportionment of joint costs to the main product and the two by-products.

- (ii) If the by-product A is not subjected to further processing and is sold at the points of separation for which there is a market at Rs 58,500 without incurring any selling expenses, would you advise its disposal at this stage? Show the workings.

Ans: (i) Expenses P Rs 58,510 A Rs 37,200 B Rs 24,020
 (ii) Total profit Rs 44,000

46. In an oil mill, four products emerge from a refining process. The total cost of input during the quarter ending March 2002 is Rs 1,48,000. The output, sales and additional processing costs are as under:

Product	Output in litres	Additional processing cost after split-off point (Rs)	Sales value Rs
AOXE	8,000	43,000	1,72,500
BOXE	4,000	9,000	15,000
COXE	2,000		6,000
DOXE	4,000	1,500	45,000

In case these products were disposed off at the split-off points, that is before further processing, the selling price would have been:

AOXE Rs 15.00; BOXE Rs 6.00; COXE Rs 3.00; DOXE Rs 7.50.

Prepare a statement of profitability based on the following facts:

- If the products are sold after further processing is carried out in the mills.
- If they are sold at the split-off point.

(CA Inter)

Ans: 1. Profit AOXE Rs 30,833, BOXE (Rs 13,733) Loss, COXE Rs 1,067, DOXE Rs 18,833.
 2. Profit AOXE Rs 21,333, BOXE Rs 4,267, COXE Rs 1,067, DOXE Rs 5,333.



Service Costing

SERVICE COSTING

Service costing, also known as operating costing, is especially used where services are rendered and articles are not produced. According to Institute of Cost and Management Accountants (UK) operating costing is “that form of operation costing which applies where standardised services are provided either by an undertaking or by a service cost centre within an undertaking”. Service costings are particularly suitable for the costing of road and rail transport services, electricity undertakings and hospitals, etc. The following cost units are usually applied in different service undertakings:

<i>Nature of Business</i>	<i>Cost Unit</i>
Public carriers, trucks, goods trains	Per tonne km or per km
Electricity supply	Per kilowatt hour
Passenger buses and trains	Per km
Hospitals	Per patient day Per bed, per operation
Road maintenance	Per km of road
Hotels	Per room
Road lighting	Per lamp
Canteen	Per meal

NATURE OF SERVICE COSTING

Service cost are usually collected under the following headings:

1. Fixed or standing charges.
2. Semi-fixed or maintenance charges.
3. Variable or running charges.

An important feature of service costing is that mostly such costs are fixed in nature. For example, the costs of operating a theatre are usually not influenced by the size of the audience.

TRANSPORT COSTING

In transport undertakings the cost unit is normally the tonne-mile or passenger-mile but the organisation of transport undertakings varies according to the nature of the undertakings. For example, rail transport is more complicated than road transport as provision has to be made not only for the vehicles but also for the maintenance of the permanent way, the station, signalling facilities, yards, engines, wagons, etc. For the railway, separate cost centres need to be established.

Composition of Costs

In transport operating costing, the total costs consist of: (i) standing charges, (ii) running (variable) charges, and (iii) maintenance charges.

Standing Charges

In motor transport costings the following are commonly the standing charges:

1. Licence duty and insurance
2. Garage costs and administrative expenses
3. Drivers' wages
4. Depreciation
5. Tax

Running (Variable) Costs

The following variable costs are found in motor transport costings:

1. Petrol
2. Oil
3. Grease

Maintenance Charges

1. Repairs and maintenance
2. Tyres
3. Garage charges

Cost Units

In transport costing, passenger-kilometre or tonne-kilometre is generally the cost unit. After collecting total cost, the cost per unit (per passenger km or tonne-km) is determined. The cost per unit is calculated as follows:

$$\text{No. of vehicles} \times \text{Capacity} \times \text{Distance travelled} \times \text{Days} \times \text{Passenger/Weight actually carried.}$$

Ascertainment of Costs

Accumulation and control of costs in transport costing are achieved through a daily log sheet and operating cost sheet. A daily log report is a document which contains information regarding each journey, e.g., passenger or weight carried, starting and returning time, distance covered, oil or petrol used. Figure 11.1 gives a proforma of a Daily Log Sheet.

Daily Log Sheet					
Vehicle No. _____			Date _____		
Driver's name _____			Starting time _____		
Licence No. _____			Returning time _____		
Particulars of Journey					
Trip No.	Starting	Arriving		Goods Carried	
Place	Time	Place	Time	Out Collected	Distance
				<i>en route</i>	
Petrol consumption:		Time lost:		Worker's time	
At start _____		Loading _____		Driver _____	
Recd./purchased		Unloading _____			
during the journey _____		Traffic _____		Mechanic _____	
At finish _____					
Total consumption _____		Accident _____		Cleaner _____	
Oil _____					
Grease _____					

Fig. 11.1 Daily Log Sheet

The operating cost sheet or cost statement is also known as the performance statement for each vehicle. Such cost sheets (Fig. 11.2) accumulate relevant costs regarding a vehicle from different sources, such as daily log sheet, wage book, purchase register or summary, repairs details, etc. Operating costs on a cost sheet are usually divided into three headings:

1. Running (variable) charges
2. Standing (fixed) charges
3. Maintenance charges

The operating cost sheet acts as a cost control device. The total and per unit cost calculated can be compared with past figures and performance can be evaluated.

POWER HOUSE COSTING

Power house costing is applied in those undertakings which are engaged in the production of steam and generation of electricity. In large firms, a power house (boiler house) is generally a service department assisting the production department. Operating cost statement in this case can be prepared after collecting data about the costs of producing the steam and costs of generating the electricity. The unit of cost for production of steam may be 'Per lb' and for generation of electricity 'per kilowatt'. A composite unit of cost may be used i.e. the kilo Watt-hour. A proforma of a power house operating cost sheet is

(ABC Transport Company)
Cost Sheet (Monthly)

Vehicle No. _____	Month _____
Registration No. _____	Days operated _____
Charges	Amount
	Rs P.
<hr/>	
(A) Running Charges:	
Petrol	
Oil	
Grease	
Total	
(B) Standing charges:	
Depreciation	
Insurance	
Interest	
Tax	
Licence fees	
Driver's salary	
Total	
(C) Maintenance charges:	
Repairs	
Tyres	
Spares	
Garage charges	
Total	
Total charges	Rs _____
Total tonne-km/passenger	km _____
Cost per tonne-km/passenger	km _____
<hr/>	

Fig. 11.2 Cost Sheet

given in Fig. 11.3. This operating cost sheet shows also different elements of cost of steam production and generation of electricity.

CANTEEN COSTING

In most organisations, canteen facilities are provided at subsidy so that food and other items can be provided at minimum price. The costs are accumulated on a cost sheet which gives the total cost incurred. From the total cost the subsidy is deducted to arrive at the net cost of operating the canteen. After comparing the net cost with the sales proceeds, profit/loss is calculated. A specimen of canteen cost sheet is given in Fig. 11.4.

Example 11.1

A Truck starts with a load of 10 tonnes of goods from station *P*. It unloads 4 tonnes at station *Q* and rest of the goods at station *R*. It reaches back directly to station *P* after getting reloaded with 8 tonnes of goods at station *R*. The distances between *P* to *Q*, *Q* to *R* and then from *R* to *P* are 40 km, 60 km and 80 km respectively. Compute Absolute tonne-km and commercial tonne-km.

(B. Com. (Hons), Delhi 1998)

Power House Cost Sheet

Items	Cost per unit (Cost per 1,000 lb)	Total cost
Month _____ Total steam consumption _____ Total steam produced _____ Electricity generated _____		
(A) Fixed overheads:		
Rent, rates, etc.		
Depreciation of plant		
Depreciation of building		
Insurance		
(B) Maintenance charges:		
Meters		
Furnance		
Service materials		
Tools and accessories		
(C) Labour charges:		
Coal handlers		
Ash removers		
(D) Fuel:		
Fuel		
Power		
(E) Water charges:		
Water purchased		
Water softening		
(F) Supervision and other charges:		
Foremen		
Engineers		
General labourer		
Cleaners		
Total		

Fig. 11.3 Power House Cost Sheet

Solution While computing the absolute tonne-km, the travel between any two stations is considered individually. However, while computing commercial tonne-km, the trip is considered as a whole. On this basis the tonne-km have been computed as follows:

Distance P \longrightarrow Q \longrightarrow R \longrightarrow P
 40 km 60 km 80 km

$$\begin{aligned} \text{Absolute tonne-km} &= 10 \text{ tonne} \times 40 \text{ km} + 6 \text{ tonne} \times 60 \text{ km} + 8 \text{ tonne} \times 80 \text{ km} \\ &= 1,400 \text{ tonne-km.} \end{aligned}$$

Commercial tonne-km = Average Load \times Total Kilometres Travelled

$$\begin{aligned} &= \left(\frac{10 + 6 + 8}{3} \right) \text{ tonne} \times 180 \text{ km} \\ &= 8 \text{ tonne} \times 180 \text{ km} \\ &= 1,440 \text{ tonne-km} \end{aligned}$$

Canteen Cost Sheet

Month _____

Items	Total costs				Cost per meal
	Current month		Previous month		
	(Rs	P)	(Rs	P)	
(A) Provisions:					
Bread					
Biscuits					
Cakes					
Eggs					
Meat					
Fish					
Vegetables					
Milk					
Fruit					
Others					
(B) Labour and supervision:					
Supervisor					
Cooks					
Helpers					
Counter clerks					
Cleaners					
Sweepers					
(C) Maintenance:					
Crockery					
Glassware					
Towels					
Rent					
Light					
Gas					
Insurance					
Consumable stores					
	Total cost				
Less:	Subsidy				
	Net cost				
	Sales				
	Profit/Loss				

Fig. 11.4 Canteen Cost Sheet

Example 11.2

A transport company maintains a fleet of lorries for carrying goods from Delhi to Panipat, 100 kms off. Each lorry, which operates 25 days on an average in a month, starts every day from Delhi with a load of 4 tonnes and returns from Panipat with a load of 2 tonnes. Calculate the total commercial tonne-kms

and cost per commercial tonne-km when the total monthly charges for a lorry are Rs 27,000. What rate per tonne should the company charge if it plans to earn a gross profit of 20% on the freightage?

(B. Com. Hons, Delhi 2000)

Solution

$$\begin{aligned}\text{Commercial tonne-kms} &= \text{Load} \times \text{Distance} \times \text{No. of days} \times \text{Capacity Utilised} \\ &= 4 \times 100 \times 25 + 2 \times 100 \times 25 \\ &= 10,000 + 5,000 \\ &= 15,000 \text{ tonne-kms}\end{aligned}$$

Cost per commercial tonne-km

$$\begin{aligned}&= \frac{\text{Total monthly charges}}{\text{Total commercial tonne - Kms}} \\ &= \frac{\text{Rs } 27,000}{15,000} \\ &= \text{Rs } 1.80\end{aligned}$$

Rate to be charged Rs

$$\text{Cost per commercial tonne-km} = 1.80$$

Add: Profit 1/5 of Sales of Freightage

$$\text{or } \quad \quad \quad \frac{1}{4} \text{ of cost } \frac{1.80 \times 1}{4} = .45$$

$$\text{Rate per tonne-km} \quad \quad \quad = 2.25$$

Example 11.3

A transport service company is running five buses between two towns which are 50 kms apart. Seating capacity of each bus is 50 passengers. The following particulars were obtained from their books for April, 1998:

	Rs
Wage of drivers, conductors and cleaners	24,000
Salaries of office staff	10,000
Diesel oil and other oil	35,000
Repairs and maintenance	8,000
Taxation, insurance etc.	16,000
Depreciation	26,000
Interest and other expenses	20,000
	1,39,000

Actually, passengers carried were 75 per cent of seating capacity. All buses ran on all days of the month. Each bus made one round trip per day.

Find out the cost per passenger km.

(C.A. Inter Nov. 1998)

Garage Rent @ Rs 200 p.m.	2,400	
Driver's Salary @ Rs 300 p.m.	3,600	
Conductor's Salary @ Rs 200 p.m.	2,400	
Stationery @ Rs 100 p.m.	1,200	
Manager cum Accountant's Salary @ Rs 700 p.m.	8,400	
Total Standing Charges	<u>23,000</u>	1,916.67
Running Expenses		
Depreciation Rs 1,00,000/5	20,000	1,666.67
Repairs	2,000	166.66
Petrol and Oil Re .50 × (40 km × 2 × 3 × 25)		3,000.00
Commission (WN I)		900.00
Profit		<u>1,350.00</u>
Total Takings		<u>9,000.00</u>
Fare per passenger km. (Rs 9,000/2,40,000)		0.0375
Fare per passenger (Rs 9,000/6,000)		Rs 1.50

Working Notes:*Computation of Commission and Profit*Let total takings be x

$$\text{Commission @ 10\%} = \frac{x}{10}$$

Hence, Profit is 15% of takings

$$\text{Profit} = \frac{15x}{100} = \frac{3x}{20}$$

Total Cost without Commission = Rs 6,750

$$\begin{aligned} \text{Hence, } x &= \text{Rs } 6,750 + \frac{x}{10} + \frac{3x}{20} \\ &= \text{Rs } 6,750 + \frac{5x}{20} \end{aligned}$$

$$\text{or } x - \frac{5x}{20} = \text{Rs } 6,750.00$$

$$\text{or } \frac{15x}{20} = \text{Rs } 6,750.00$$

$$\begin{aligned} \text{or } x &= \frac{\text{Rs } 6,750.00 \times 20}{15} \\ &= \text{Rs } 9,000.00 \text{ (Total takings)} \end{aligned}$$

1. Hence: Commission 10% of total takings = Rs 900.00

Profit @ 15% of total takings = Rs 1,350.00

2. Total Effective Passenger-km per month

$$= 40 \text{ km} \times 2 \text{ (up and down)} \times 3 \text{ (trips)} \times 25 \text{ days} \times 40 \text{ passengers}$$

$$= 2,40,000 \text{ passenger-km per month}$$

3. Total Passengers carried per month
 = 40 passengers \times 2 (up and down) \times 3 (trips) \times 25 = 6,000 passengers

Example 11.5

Global Transport Ltd. charges Rs 90 per ton for its 6 tons truck lorry load from city A to city B. The charges for the return journey are Rs 84 per ton. No concession or reduction in these rates is made for any delivery of goods at intermediate station C. In January, 1997 the truck made 12 outward journeys for city B with full load out of which 2 tons were unloaded twice in the way at city C. The truck carried a load of 8 tons in its return journey for 5 times but was once caught by police and Rs 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city C. The distance from city A to city C and city B are 140 kms and 300 kms respectively.

Annual fixed costs and maintenance charges are Rs 60,000 and Rs 12,000 respectively. Running charges spent during January, 1997 are Rs 2,944.

You are required to find out the cost per absolute ton-kilometer and the profit for January, 1997.
 (C.A. Inter May 1997)

Solution

Global Transport Ltd.
Operating Cost and Profit Statement During January, 1997

	<i>Amount</i>
	Rs
Fixed Costs (Rs 60,000/12)	5,000
Maintenance Charges (Rs 12,000/12)	1,000
Running Costs	2,944
Total operating cost	8,944
Cost per absolute ton-km (Rs 8,944/44, 720 absolute tons kms)	0.20
Net Revenue received (WN 4)	12,168
Less: Total Operating Costs (as given above)	8,944
Profit	3,224

Working Notes:

1. Absolute ton-kms for outward journeys:

(i) From city A to city B:		
10 journeys \times 300 kms \times 6 tons	=	18,000 ton-kms
(ii) From city A to city C:		
2 journeys \times 140 kms \times 6 tons	=	1,680 ton-kms
(iii) From city C to city B:		
2 journeys \times 160 kms \times 4 tons	=	1,280 ton-kms
Total:		20,960 ton-kms

2. Absolute kms for return journeys:

(i) From city B to city A:		
5 journeys \times 300 kms \times 8 tons	=	12,000 ton-kms

6 journeys × 300 kms × 6 tons	=	10,800 ton-kms
(ii) From city B to city C:		
1 journey × 160 kms × 6 tons	=	960 ton-kms
Total		<u>23,760 ton-kms</u>

3. *Total Absolute Ton-kms of outward and return journeys:*
 = 20,960 ton-kms + 23,760 ton-kms = 44,720 ton-kms.
4. *Net Revenue received during January, 1997:*

	<i>Rs</i>
12 trucks × 6 tons × Rs 90 (from city A to city B)	6,480
5 trucks × 8 tons × Rs 84 (from city B to city A)	3,360
6 trucks × 6 tons × Rs 84 (from city B to city A)	3,024
1 truck × 6 tons × Rs 84 (from city B to city C)	<u>504</u>
Total Revenue:	13,368
Less: Fine paid	1,200
Net Revenue received	<u>12,168</u>

Example 11.6

Saitravel owns a bus and operates a tourist service on daily basis. The bus starts from Newcity to Restvillage and returns back to Newcity the same day. Distance between Newcity and Restvillage is 250 kms. This trip operates for 10 days in a month. The bus also plies for another 10 days between Newcity and Shivapur and returns back to Newcity the same day; distance these two places is 200 kms. The bus makes local sightseeing trips for 5 days in a month, covering a total distance of 60 kms per day.

The following data are given:

Cost of Bus Rs 3,50,0000

Depreciation 25%

Driver's salary Rs 1,200 p.m.

Conductor's salary Rs 1,000 p.m.

Part-time clerk's salary Rs 400 p.m.

Insurance Rs 1,800 p.a.

Diesel consumption 4 kms per litre @ Rs 8 per litre.

Token tax Rs 2,400 p.a.

Permit fee Rs 1,000 p.m.

Lubricant oil Rs 100 for every 200 kms.

Repairs and maintenance Rs 1,500 p.m.

Normal capacity 50 persons).

While plying to and from Restvillage the bus occupies 90% of the capacity and 80% when it plies between Newcity to Shivapur (both ways). In the city the bus runs full capacity. Passenger Tax is 20%

of net takings of the travels' firm. Calculate the rate to be charged to Restvillage and Shivapur from Newcity per passenger, if the profit required to be earned is 33% of net takings of the firm.

(CA Inter June 1995)

Solution

Basic Calculations

(i) <i>Total kms covered per month</i>	<i>Kms</i>
Restvillage and Back $2 \times 250 \times 10$ days	5,000
Shivapur and back $2 \times 200 \times 10$ days	4,000
Local Trips @ 60 km for 5 days	300
	<u>9,300</u>

(ii) *Fuel Cost*

$$(a) \text{ Diesel required } \frac{9,300}{4} \times 8 = 18,600$$

$$(b) \text{ Oil required } \frac{9,300}{200} \times 100 = 4,650$$

23,250

(iii) *Total Effective Passenger-km per month*

$$\text{Restvillage } 2 \times 250 \times 50 \times 10 \times 90/100 = 2,25,000$$

$$\text{Shivapur } 2 \times 200 \times 50 \times 10 \times 80/100 = 1,60,000$$

$$\text{Local trips } 5 \times 60 \times 50 = 15,000$$

4,00,000

(iv) *Computation of Operating Cost*

Operating Cost Statement for the Month

	Rs		Rs
<i>Fixed Charges :</i>			
Driver's Salary	1,200		
Conductor's Salary	1,000		
Clerk's Salary	400		
Insurance 1,800/12	150		
Token Tax 2,400/12	200		
Permit Fee	1,000	=	3,950
<i>Running Charges :</i>			
Depreciation			
$3,50,000 \times \frac{25}{100 \times 12}$	7,292		
Repairs and Maintenance	1,500		
Fuel Cost	<u>23,250</u>	=	<u>32,042</u>
Total Cost		=	<u>35,992</u>

Computation of Charges Per Passenger km

Total Cost (as per (4) above)	Rs	35,992
Profit on Takings (WN 1)	Rs	53,719
Add: 20% for Passenger Tax (WN 2)	Rs	10,744
Total Fare	Rs	64,462

$$\begin{aligned} \text{Rate per Passenger km} &= \frac{\text{Total Fare}}{\text{Effective Passenger km per month}} \\ &= \frac{\text{Rs } 64,462}{4,00,000} = \text{Re } 0.161 \end{aligned}$$

Charges per passenger

- (a) From Newcity to Restvillage : $250 \times 0.161 = \text{Rs } 40.25$
 (b) From Newcity to Shivapur : $200 \times 0.161 = \text{Rs } 32.20$

Working Notes:1. *Computation of Net Takings*

Let total takings be x

Profit is 33% of Net Takings (i.e. before passenger tax) = $.33x$

$$x = 35,992 + .33x$$

$$\text{or } .67x = 35,992$$

$$\text{or } x = \text{Rs } 53,719$$

2. *Computation of Passenger Tax (20% of Net Takings)*

$$53,719 \times 20/100 = \text{Rs } 10,744$$

Example 11.7

SMC is a public school having five buses each plying in different directions for the transportation of its students. In view of a large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The workload of the students has been so arranged that in the morning the first trip picks up senior students and the second trip plying an hour later picks up the junior students.

Similarly, in the afternoon the first trip drops the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus one way is 8 km. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by students for all the 12 months in a year.

The details of expenses for a year are as under:

	<i>Rs</i>	
Driver's salary	450	per month
Cleaner's salary	350	per month
(Salary payable for all 12 months)		
(One cleaner employed for all the five buses)		

Licence fee, taxes, etc.	860	per bus p.a.
Insurance	1,000	per bus p.a.
Repairs and maintenance	3,500	per bus p.a.
Purchase price of the bus	1,50,000	each
Life 12 years		
Scrap value	30,000	
Diesel cost	2.00	per litre

Each bus gives an average mileage of 4 km per litre of diesel.

Seating capacity of each bus is 50 students.

The seating capacity is fully occupied during the whole year.

Students picked up and dropped within a range of upto 4 km of distance from the school are charged half fare and 50% of the students travelling in each trip are in this category. Ignore interest. Since the charges are to be based on average cost you are required to:

- Prepare a statement showing the expenses of operating a single bus and a fleet of five buses for a year.
- Work out the average cost per student per month in respect of:
 - Students coming from a distance of upto 4 km from the school, and
 - Students coming from a distance beyond 4 km from the school.

(CA Inter, B. Com. (Hons), Delhi, 1995)

Solution

SMC Public School Operating Cost Statement

Particulars	Rate		Per bus p.a.		Fleet of 5 buses p.a.	
	(Rs)		(No.)	(Rs)	(No.)	(Rs)
Driver's salary	450	p.m	1	5,400	5	27,000
Cleaner's salary	350	p.m	1/5	840	1	4,200
Licence fee, taxes, etc.	860	p.a.		860		4,300
Insurance	1,000	p.a.		1,000		5,000
Repairs and maintenance	3,500	p.a.		3,500		17,500
Depreciation	10,000	p.a.		10,000		50,000
Diesel (see Note 1)				7,200		36,000
				<u>28,800</u>		<u>1,44,000</u>
Cost per month				2,400		12,000
No. of students on half fee basis (see Note 2)				150		750
Cost per student (half fee)				Rs 16.00		Rs 16.00
Cost per student (full fee)				Rs 32.00		Rs 32.00

Working Notes:

- Calculation of diesel cost per bus.
 Number of trips of 8 km each day; 8
 Distance travelled per day by a bus: 8×8 km trip (64 km)

Distance travelled during a month: $64 \times 25 = 1,600$ km

Distance travelled p.a. $1,600 \times 9 = 14,400$ km

(May, June and December being vacation)

Mileage 4 km/litre

Diesel required $14,400/4 = 3,600$ litres

Cost of diesel @ Rs 2 per litre = Rs 7,200 p.a per bus

2. Calculation of number of student per bus:

Bus capacity		50	students
Half fare:	50%, i.e.	25	students
Full fare:	50%, i.e.	25	students
Full fare students as equivalent to half fare			
Students, i.e.		50	students
Total number of half fare students		75	students per trip
Total number of half fare students in two trips		150	students
On full fare basis, number of			
students in two trips		75	students

Example 11.8

A lodging home is being run in a small hill station with 50 single rooms. The home offers concessional rates during six off-season months in a year. During this period, half of the full-room rent is charged. The management's profit margin is targeted at 20% of the room rent. The following are the cost estimates and other details for the year ending 31st March, 1996 (assume a month to be of 30 days):

(a) Occupancy during the season is 80%, while in the off season is 40% only;

(b) Expenses:

Rs

- | | |
|--|----------|
| (i) Staff Salary (excluding room attendants) | 2,75,000 |
| (ii) Repairs to Buildings | 1,30,500 |
| (iii) Laundry and Linen | 40,000 |
| (iv) Interior and Tapestry | 87,500 |
| (v) Sundry Expenses | 95,400 |
- (c) Annual depreciation is to be provided for buildings at 5% and on furniture and equipments at 15% on straight line basis:
- (d) Room attendants are paid Rs 5 per room day on the basis of occupancy of the rooms in a month;
- (e) Monthly lighting charges are Rs 120 per room, except in four months of winter when it is Rs 30 per room and this cost is on the basis of full occupancy for a month; and
- (f) Total investments in the home is Rs 100 lakhs of which Rs 80 lakhs relate to buildings and balance for furniture and equipments.

You are required to work out the room rent chargeable per day both during the season and the off season months, on the basis of the foregoing information. (I.C.W.A. Inter Dec. 1995)

Solution

Basic Calculations

(i) Computation of Estimated Costs for the year ending 31.3.1996

	Rs
Salary	2,75,000
Repairs	1,30,500
Laundry and Linen	40,000
Interior Decoration	87,500
Depreciation;	
5% on 80 lakhs	4,00,000
15% on 20 lakhs	3,00,000
	7,00,000
Miscellaneous Expenses	95,400
Total Costs	13,28,400

(ii) Number of Room Days in a year:

Season's Occupancy for 6 months @ 80% ($50 \times 0.8 \times 6 \times 30$) = 7,200 room daysOff-season's occupancy for 6 months @ 40% ($50 \times 0.4 \times 6 \times 30$)
= 3,600 room daysTotal Room Days during the year 10,800

(iii) Attendants' Salary

For 10,800 Room Days @ Rs 5 per day = Rs 54,000

(iv) Light Charges for 8 months at Rs 120 per month or $120/30 =$ Rs 4 per room dayLight Charges for 4 months of winter at Rs 30 per month or $30/30$

= Re 1 per room day

Total Lighting Charges:

— during season @ Rs 4 for 7,200 days Rs. 28,800— during 2 months of off-season @ Rs 4
for 1,200 days ($2/6 \times 3,600$) 4,800— during 4 months of winter at Re.1
for 2,400 days ($4/6 \times 3,600$) 2,400Total 36,000

Statement of Total Estimated Cost

	Rs.
1. Expenses as per (i) above	13,28,400
2. Attendants' salary as per (iii) above	54,000
3. Lighting Charges as per (iv) above	36,000
Total Cost	14,18,400

Computation of Total Full Room Days

During Season 7,200During Off-season (equivalent to 50% rate of 3,600 days) 1,800

Total Full Room Days	<u>9,000</u>
<i>Computation of Room Rent</i>	
Cost per Room Day (i.e., 14,18,400/9,000)	Rs 157.60
Add: Profit Margin at 20% of rent or 25% of cost	<u>39.40</u>
Room Rent	<u>197.00</u>

Thus, during season, room rent of Rs 197 is to be charged.

During off-season, room rent of Rs 98.50 is to be charged.

Example 11.9

A manufacturing firm facing shortage of electric power supply from the State Electricity Board has set up its own power generation plant for efficient running of its production units in the factory. The following information has been taken from the records in connection with the generation of power for a month:

- (1) Number of units generated was 10,00,000 for the month of which 10% was utilised by the generator department.
- (2) Consumption data of materials, etc. for the month:
 - (a) Coal consumed 300 MTs @ Rs 3,600 per MT
 - (b) Oil consumed 4.5 MTs @ Rs 40,000 per MT
 - (c) Cost of water extraction and treatment for 6 lakh litres @ Rs 1.25 per litre.
- (3) Steam boiler costs Rs 20 lakhs with a residual value of Rs 2 lakhs after a life of 10 years.
- (4) Salaries and wages per month:
 - (a) For staff of generating plant:
 - (i) 100 skilled workers @ Rs 3,000 p.m.
 - (ii) 150 helpers @ Rs 1,500 p.m.
 - (b) For staff of boilers hours:
 - (i) 60 category A workers @ Rs 1,500 p.m.
 - (ii) 100 category B workers @ Rs 1,000 p.m.
- (5) Cost of generating plant: Rs 36 lakhs with no residual value. Depreciation @ 10% on straight line basis is to be charged.
- (6) Repairs and maintenance of generating plant and boiler Rs 50,000 p.m.
- (7) Share of administrative charges Rs 40,000 p.m.
- (8) Sales value of Cash disposed of Rs 15,000 p.m.

Calculate the per unit cost of electricity generated using a cost sheet format.

(I.C.W.A. Inter June 1996)

Solution

Power Generation Cost Sheet for the Month of.....

Unit generated: 10 lakh units

Particulars	Total Cost (Rs in lakhs)	Cost per unit (Rs)
Coal 300 MTs @ Rs 3,600 MT	10.80	1,200.00
Oil 4.5 MTs @ Rs 40,000 per MT	1.80	0.200

(Contd.)

Water Extraction and Treatment Charges [6 lakhs litres @ 1.25]	7.50	0.833
	<u>20.10</u>	<u>2.233</u>
Depreciation on Steam Boiler $\left(\frac{20-2}{10}\right) = 1.8$ p.a. or 0.15 p.m.	0.15	0.017
	<u>20.25</u>	<u>2.250</u>
Less: Sale of Cash	<u>0.15</u>	<u>0.017</u>
	<u>20.10</u>	<u>2.233</u>
Salaries and Wages	7.15	0.794
Boiler House	5.25	
Generating Plant	<u>1.90</u>	
	<u>7.15</u> lakhs p.m.	
Repairs and Maintenance	0.50	0.056
Depreciation on Generating Plant 10% of Rs 36 lakhs or 3.6 lakhs or Rs 0.30 lakhs p.a.	0.30	0.033
Sale of Administrative Expenses	<u>0.40</u>	<u>0.045</u>
	<u>28.45</u>	<u>3.161</u>
Add: Cost of Electricity used by generation department 10% of 10 lakh units of 1 lakh units	3.16	0.351
Total Cost	<u>31.61</u>	<u>3.512</u>
Cost per unit generated is Rs 3.512 or Rs 3.51		

Working Notes:

I. The cost of generation has to bear the cost of electricity used by generation department. Thus, the total cost represented cost of 9 lakh units and not 10 lakh units (since 1 lakh units are used by generation dept.) Unit cost has been computed on this basis.

II. Total Cost of Generation = Rs 28.45 lakhs + Cost of Electricity used by Generation Plant Dept.
Taking total cost as x

$$x = 28.45 + 1/10x$$

or $9/10x = 28.45$ lakhs

or $x = 28.45 \times 10/9 = \text{Rs } 31.61$ lakhs

Cost of electricity used by generation dept. comes to $31.61 \times 1/10 = 3.16$ lakhs

Example 11.10

Mr Harry is a travelling inspector for the Environment Production Agency. He uses his own car and the agency reimburses him at Rs 1.80 per kilometre. Mr Harry claims he needs Rs 2.20 per kilometre just to break even. A scrutiny of his expenses by the agency reveals the following:

Oil charge every 4,800 km	Rs
Maintenance (other than oil) every 9,600 km	120
	1,800

Yearly insurance (comprehensive with accident benefits)	4,000
Cost of car, with an average residual value of Rs 60,000 and with a useful life of 3 years.	1,08,000

Petrol is Rs 5 a litre and Harry gets 8 kms per litre for his car. When Harry is on the road, he averages 192 kilometres a day. He works 5 days a week, has 10 days vacation in a year besides 6 holidays and spends 15 working days a month in the office.

You are required to determine:

- (a) An equitable rate of reimbursement on the basis of the schedule he presently follows and (b) the number of kilometres a year he would have to travel, to break-even at the current rate of reimbursement.

(ICWA Inter)

Solution

Total days in a year	365 days	
Less: Non-working days = 2×52	104 days	
Number of working days in a year = $5 \times 52 = 260 + 1$	261 days	
Less: Vacation	10 days	
Holidays	6 days	
Office work $15 \times 12 =$	180 days	196 days
		Net 65 days \times 192 kms = 12,480 kms in a year

Statement of Operational Cost Per Kilometre

Particulars	Basic of apportionment	Amount Rs	Per km Rs
A. Fixed Charges:			
Depreciation	$\frac{1,08,000 - 60,000}{3} = 16,000$		
Yearly insurance	4,000		
Total:	<u>20,000</u>		
Fixed charges per km	$\left(\frac{20000}{12480}\right)$		1.626
B. Variable Cost:			
Oil, charge = $\frac{120}{4800} \times 12,480$		312.00	0.0250
Maintenance = $\frac{1800}{9600} \times 12,480$		2340.00	0.1875
Petrol $\frac{5}{8} \times 12,480$		7800.00	0.6250
Total:		<u>10,452.00</u>	<u>0.8375</u>

Total Cost (A + B)	30,452.00	2.4401
(a) Equitable rate of reimbursement =		2.44
(b) Current reimbursement rate = 1.80 per km		
Less: Variable cost = $\frac{0.8375 \text{ per km}}{\quad}$		
Contribution $\frac{0.9625 \text{ per km}}{\quad}$		
B.E.P. (km) = $\frac{\text{Fixed cost}}{\text{Contribution per kilometre}} = \frac{20,000}{0.9625} = 20,780 \text{ kms}$		

He has to travel 20,780 kms in a year in order to break even at the current rate of reimbursement, i.e. 320 km average daily instead of present average of 192 km a day.

Example 11.11

A Mineral is transported from two mines- 'A' and 'B' and unloaded at plots in a Railway Station. Mine A is at a distance of 10 kms and B is at a distance of 15 kms from railhead plots. A fleet of lorries of 5 tonne carrying capacity is used for the transport of mineral from the mines. Records reveal that the lorries average a speed of 30 kms per hour, when running and regularly take 10 minutes to unload at the railhead. At mine 'A' loading time averages 30 minutes per load while at a mine 'B' loading time averages 20 minutes per load.

Drivers' wages, depreciation, insurance and taxes are found to cost Rs 9 per hour operated. Fuel, oil, tyres, repairs and maintenance cost Rs 1.20 per km.

Draw up a statement, showing the cost per tonne -kilometer of carrying mineral from each mine.

(C.A. Inter Nov 2000)

Solution

Statement showing the cost per tonne-kilometer of carrying mineral from each mine

	Mine A Rs	Mine B Rs
<i>Fixed cost per trip:</i>		
(Driver's wages, depreciation, insurance and taxes)		
A: 1 hour 20 minutes @ Rs 9 per hour	12	
B: 1 hour 30 minutes @ Rs 9 per hour		13.50
(Refer to Working note 1)		
<i>Running and maintenance cost:</i>		
(Fuel, oil, tyres, repairs and maintenance)		
A: 20 kms Rs 1.20 per km.	24	
B: 30 kms Rs 1.20 per km		36.00
Total cost per trip	36	49.50
Cost per tonne-km	0.72	0.66
(Refer to Working note 2)	(Rs 36/50 tonnes-kms)	(Rs 49.50/75 tonnes-kms)