

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:

	<i>A</i>	<i>B</i>	<i>C</i>	<i>B.H.</i>	<i>P.R.</i>
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.

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

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

$$10X - 2Y = 23,40,000 \tag{i}$$

$$-X + 10Y = 30,00,000 \tag{ii}$$

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

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

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

$$Y = 3,30,000$$

Distribution of Overheads

	<i>Total</i>	<i>Departments</i>		
	<i>Rs.</i>	<i>A</i> <i>Rs.</i>	<i>B</i> <i>Rs.</i>	<i>C</i> <i>Rs.</i>
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

	<i>Total</i>	<i>Departments</i>				
		<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
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

<i>Departments</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
<i>X</i>	20%	30%	40%	—	10%
<i>Y</i>	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**

<i>Items</i>	<i>Basis of apportionment</i>	<i>Total</i>	<i>Production Deptts.</i>			<i>Service Deptts.</i>	
			<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	
<i>Primary Distribution</i>							
Direct wages	Actual (only service deptts.)	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

(Contd.)

(Contd.)

Items	Basis of apportionment	Total Rs.	Production Deptts.			Service Deptts.	
			A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
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 Deptt. X overheads apportioned to Deptts. A, B, C & Y in (20 : 30 : 40 : 10)			4,625	6,937	9,250	(23,125)	2,313
Service Deptt. Y overheads apportioned to Deptts. A, B, C & X in (40 : 20 : 30 : 10)			4,075	2,038	3,056	1,019	(10,188)
Service Deptt. X overheads apportioned to Deptts. A, B, C & Y in the given proportion			204	306	407	(1,019)	102
Service Deptt. Y overheads apportioned to Deptts. A, B, C & X in the given proportion			41	20	31	10	(102)
Service Deptt. X overheads apportioned to Deptts. 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		
Prime Cost			
Overheads Cost			
Deptts.	Hours Consumed	Rate	Rs.
A	4	7.50	= 30.00
B	5	11.25	= 56.25
C	3	15.00	= 45.00
			131.25
Total Cost of Production			531.25

Example 6.7

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 Rs.	P_2 Rs.	P_3 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

Example 6.8

A manufacturing company has two production departments X and Y and three service departments—time keeping, stores and maintenance.

Time-keeping department is rendering services to two production departments and two other service departments, store department is rendering services to maintenance department along with production departments and maintenance department is rendering service to production departments only. You are required to prepare a statement showing apportionment of overheads of service departments from the following information:

Production departments			Rs.		Total
X			16,000		
Y			10,000		26,000
Service departments:					
Time-keeping			4,000		
Stores			5,000		
Maintenance			3,000		12,000
The other information is:					
	X	Y	Time-keeping	Stores	Maintenance
Number of Employees	40	30	20	16	10
Number of stores requisition	24	20	—	—	6
Number of machine hours	2400	1600	—	—	—

(B.Com. (Hons), Delhi, 2004)

Solution:

Departments	As per primary distribution summary				
	Rs.	Rs.			
Time-keeping	4000	(-) 4000			
Store	5000	800	(-) 5800		
Maintenance	3000	400	696	(-) 4096	
X	16000	1600	2784	2458	22842
Y	10000	1200	2320	1638	15148
	38000				38000

Note: Basis of apportionment:

- (a) Time-keeping: No of employees (that is, 2 : 1 : 4 : 3)
- (b) Stores: Number of store requisition (that is, 3 : 12 : 10)
- (c) Maintenance: Machine hours (that is, 3 : 2)

The most important limitation of this method is that cost of one service centre to other service cost centres is ignored and thus the cost of individual cost centres are not truly reflected.

Example 6.9

A company has three production departments and two service departments. The departmental distribution summary for a particular period has the following totals. You are required to compute the total share of overheads of the service departments to be distributed to production departments:

Production Department:	Total
(P ₁ —Rs. 800; P ₂ —Rs. 700; P ₃ —Rs. 500)	Rs. 2,000
Service Departments:	
(S ₁ —Rs. 234; S ₂ —Rs. 300)	Rs. 534

The expenses of Service Departments are charged out on a percentage basis as follows:

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

(B.Com. (Hons), Delhi, 2006)

Solution:**Overhead Apportionment Summary (using Repeated Distribution Method)**

Details	Production Department			Service Deptt.	
	P_1	P_2	P_3	S_1	S_2
Allocated Exp	800	700	500	234	300
Apportion Expenses of S_1 to all other deptt. in 2 : 4 : 3 : 1	46.80	97.60	70.20	- 234	23.40
	846.80	797.60	570.20	0	323.40
Apportioning Exp. of S_2 to all other in the ratio of 4 : 2 : 2 : 2	129.36	64.68	64.88	64.88	- 323.40
	976.16	862.28	634.88	64.68	0
Apportioning Exp. of S_1 to other deptt. in the ratio of 2 : 4 : 3 : 1	12.94	25.88	19.40	- 64.68	6.46
	989.10	888.16	654.28	0	6.46
Apportioning Exp. of S_2 to other deptt. in the ratio of 4 : 2 : 2 : 2	2.59	1.29	1.29	1.29	- 6.64
	991.69	889.45	655.57	1.29	0
Apportioning Exp. of S_1 to other deptts in the ratio of 2 : 4 : 3 : 1	0.29	0.57	0.43	- 1.29	0.12
	991.98	890.02	656.00	0	0.12
					Negligible
Total overhead of Production deptts. are	992	890	656 (Rounded off)		

Simultaneous Equation Method

Let x be the total overhead of service department S_1 and y be the total overhead of service department S_2 .

$$\therefore x = 234 + 20\% y = x = 234 + 1/5y \quad (i)$$

$$y = 300 + 10\% x = y = 300 + 1/10x \quad (ii)$$

Multiply Eq. (i) by 5 and (ii) by 10

$$5x = 1170 + y \quad (i)$$

$$10y = 3000 + x \quad (ii)$$

or

$$5x - y = 1170 \quad (i)$$

$$-x + 10y = 3000 \quad (ii)$$

Multiply Eq. (i) by 10

$$50x - 10y = 11700$$

$$-x + 10y = 3000$$

$$49x = 14700$$

$$x = \frac{14700}{49} \text{ Rs. } 300$$

Putting the value of x in Eq. (ii)

$$10y = 3000 + 300$$

$$10y = 3300$$

$$y = \frac{3300}{10} = 330$$

Secondary Distribution Summary

	P_1	P_2	P_3
(i) Primary Distribution	Rs. 800	700	500
(ii) 90% of S_1 Exp distributed in Prod. deptt. in the ratio of 2 : 4 : 3	60	120	90
(iii) 80% of S_2 Exp distri. in Prod. deptt. in the ratio of 4: 2: 2	132	66	66
Total overhead of P_1, P_2, P_3	992	886	656

Example 6.10

A factory has three production departments A, B and C and also two service departments X and Y . The primary distribution of the estimated overheads in the factory has just been completed. These details and the quantum of service rendered by the service departments, to the other departments are given below:

Departments	A	B	C	X	Y
Primary distribution (Rs.)	2,40,000	2,10,000	2,50,000	1,40,000	96,000
Service rendered by					
Deptt. 'X'	30%	20%	35%	—	15%
Deptt. 'Y'	25%	40%	25%	10%	—

Prepare a statement showing the distribution of service deptt. overheads to the production departments by the simultaneous equation method. (I.C.W.A., Inter, Stage 1, Dec. 2004)

Solution:

Let P and N be the total overheads of the service departments X and Y respectively.

Then, $P = 1,40,000 + 0.10 N$ that is, $10P - N = 1,40,000$

$N = 96,000 + 0.15P$ and $-0.15P + N = 96,000$

(By adding) $9.85P = 14,96,000$

$$P = \frac{14,96,000}{9.85} = \text{Rs. } 1,51,878$$

By substitution, $N = 96,000 + 0.15 \times 1,51,878$

$$= 96,000 + 22,782 = \text{Rs. } 1,18,782$$

Statement showing the distribution of service departments overheads to the Production departments

(Production depts)				
	A(Rs.)	B(Rs.)	C(Rs.)	Total(Rs.)
Distribution of overheads of Deptt X (85% of Rs. 1,51,878)	45,563	30,376	53,157	1,29,096
Deptt Y (90% of Rs. 1,18,782)	29,696	47,513	29,695	1,06,904
Total	75,259	77,889	82,852	2,36,000

Example 6.11

The following cost information for a period is available for a small engineering unit:

(a) Allocated expenditure

Allocated					
	Total (Rs.)	Production Departments		Service Departments	
		Machine Shop	Assembly	General Plant Services	Stores and Misc.
Indirect wages	29,300	8,000	6,000	4,000	11,300
Stores consumed	6,700	2,200	1,700	1,100	1,700
Supervisory salaries	14,000	—	—	14,000	—
Other salaries	10,000	—	—	10,000	—

(b) Expenditure to be apportioned

Power and Fuel	Rs. 15,000
Rent	15,000
Insurance	3,000
Depreciation	1,00,000

(c) Additional information available:

	Floor Area (Sq. ft.)	H.P. hrs.	No. of Employees	Investment (Rs.)
Machine Shop	2,000	3,500	30	6,40,000
Assembly	1,000	500	15	2,00,000
General Plant	500	—	5	10,000
Stores and Maintenance	1,500	1,000	10	1,50,000

(d) Basis of distribution of service deptt. costs:

	Machine Shop	Assembly	General Plant Services	Stores and Misc.
Stores and Maintenance	50%	20%	30%	—
General Plant and Service	In proportion to the number of employees			

You are required to prepare an overhead distribution statement in detail. Service department costs are to be distributed by continued distribution. Carry through three cycles. Calculations to be shown to the nearest rupee.

(I.C.W.A., Inter, Stage I, Dec. 2003)

Solution:

**Small Engineering Unit
Departmental Primary Distribution Summary**

Rs.

	Basis of allocation	Total	Production Departments		Service Departments	
			Machine shop	Assembly	General Plant Services	Stores and Misc.
(A) Allocated Expenditure (Rs.)						
Indirect wages	Direct	29,300	8,000	6,000	4,000	11,300
Stores consumed	Direct	6,700	2,200	1,700	1,100	1,700
Supervisory salaries	Direct	14,000	—	—	14,000	—
Other salaries	Direct	10,000	—	—	10,000	—
(B) Apportioned Expenditure (Rs.)						
Power and Fuel	H.P. × hrs	15,000	10,500	1,500	—	3,000
Rent	Floor Area (Sq. ft)	15,000	6,000	3,000	1,500	4,500
Insurance	Investment	3,000	1,920	600	30	450
Depreciation	Investment	1,00,000	64,000	20,000	1,000	15,000
		1,93,000	92,620	32,800	31,630	35,950

Secondary Distribution Summary

Rs.

Particulars	Total	Production Departments		Service Departments	
		Machine shop	Assembly	General Plant	Stores and Misc.
As per Primary Distribution	1,93,000	92,620	32,800	31,630	35,950
Re-distribution of Stores & Misc. (50%, 20%, 30%)		17,975	7,190	10,785	(35,950)
		1,10,595	39,990	42,415	—
Re-distribution of General Plant (30 : 15 : 10)		23,135	11,568	(42,415)	7,712
		1,33,730	51,558	—	7,712
Re-distribution of Stores & Misc. (50%, 20%, 30%)		3,856	1,542	2,314	(7,712)
		1,37,586	53,100	2,314	—
Re-distribution of General Plant (30 : 15 : 10)		1,262	631	(2,314)	421
		1,38,848	53,731	—	421
Re-distribution of Stores & Misc. (50%, 20%, 30%)		211	84	126	(421)
		1,39,059	53,815	126	—
Re-distribution of General Plant & (30, 15, 10)		69	34	(126)	23
		1,39,128	53,849	—	23
Distribution of Stores & Misc. (50%, 20%, 30%)		16	7	—	(23)
	1,93,000	1,39,144	53,856	—	—

Example 6.12

MM Ltd. has three production departments X, Y, Z and two service departments S and C. The following details are extracted from the books of accounts in respect of indirect expenses incurred during April 2005:

Indirect Cost:	Amount (Rs.)
Indirect wages	9,000
Lighting and heating	1,200
Rent and rates	12,000
Electric power	6,000
Depreciation	24,000
Sundry expenses	7,800
	<u>60,000</u>

Following further details are collected for distribution of the above costs:

Particulars	Departments				
	X	Y	Z	S	C
Value of machinery (in Rs. '000)	60	50	80	10	–
Horse power of machines	40	45	60	5	–
Light points (Nos.)	20	30	40	20	10
Floor space(sq. metres)	150	200	250	100	50
Direct wages (in Rs. '000)	30	20	40	4	6
Machine hours worked	4250	3380	7120		

The costs of the service departments are apportioned percentagewise as follows:

Departments	X	Y	Z	S	C
S	20	30	40	–	10
C	40	20	30	10	–

Calculate:

- Overhead Recovery Rates showing the basis of apportionment.
- Total cost of job 321 (with elementwise and departmentwise cost break down), the job card of which contain the following details:

Particulars	Deptt. X	Deptt. Y	Deptt. Z
Direct materials used	Rs. 268	Rs. 131	Rs. 102
Direct wages	Rs. 300	Rs. 250	Rs. 300
Machine hours worked	10	12	12

(I.C.W.A, Inter, Stage 1, Dec. 2005,
Dec. 2006)

Solution: M.M. LTD

(a) Overhead Recovery Rates:

**Departmental Overhead Distribution Summary
(Repeated Distribution Method)**

Rs.

Items	Basis of Apportionment	Total	Production Deptt.			Service Deptt.	
			X	Y	Z	S	C
Indirect wages	Direct wages	9,000	2,700	1,800	3,600	360	540
Lighting and heating	No. of light points	1,200	200	300	400	200	100
Rent and rates	Floor space	12,000	2,400	3,200	4,000	1,600	800
Electric power	H.P. of machines	6,000	1,600	1,800	2,400	200	
Depreciation	Value of machines	24,000	7,200	6,000	9,600	1,200	
Sundry Expenses	Direct wages	7,800	2,340	1,560	3,120	312	468
Direct wages	As given	10,000	—	—	—	4,000	6,000
Total		70,000	16,440	14,660	23,120	7,872	7,908
Service Deptt. S	Given						
	(20%, 30%, 40%, 10%)		1,574	2,362	3,149	(7,872)	787
Service Deptt. C	(40%, 20%, 30%, 10%)		3,478	1,739	2,609	869	(8,695)
Service Deptt. S	(20%, 30%, 40%, 10%)		174	261	347	(869)	87
Service Deptt. C	(40%, 20%, 30%, 10%)		35	17	26	9	(87)
Service Deptt. S	(20%, 30%, 40%)		2	3	4	(9)	—
Total			21,703	19,042	29,255	—	—
Machine hours worked	Hrs.		4,250	3,380	7,120		
Overhead Recovery Rate (Rs.) (overhead/Machine hr.)			5.11	5.63	4.11		

(b) Computation of Total Cost of Job-321

Particulars	Deptt. X	Deptt. Y	Deptt. Z	Total
Machine hours worked	10	12	12	
	Rs.	Rs.	Rs.	Rs.
Direct material used	268	131	102	501
Direct wages	300	250	300	850
Overhead Cost	51	68	49	168
Total	619	449	451	1519

Example 6.13

PQR Ltd. has its own power plant, which has two users, cutting department and welding department. When the plans were prepared for the power plant, top management decided that its practical capacity should be 1,50,000 machine hours. Annual budgeted practical capacity fixed costs are Rs. 9,00,000 and budgeted variable costs Rs. 4 per machine-hour. The following data are available:

	<i>Cutting Department</i>	<i>Welding Department</i>	<i>Total</i>
Actual Usage in 2002-03 (Machine hours)	60,000	40,000	1,00,000
Practical capacity for each department (machine hours)	90,000	60,000	1,50,000

Required

- (i) Allocate the power plant's cost to the cutting and the welding department using a single rate method in which the budgeted rate is calculated using practical capacity and costs are allocated based on the actual usage.
- (ii) Allocate the power plant's cost to the cutting and welding departments, using the dual-rate method in which fixed costs are allocated based on practical capacity and variable costs are allocated based on actual usage.
- (iii) Allocate the power plant's cost to the cutting and welding departments using the dual-rate method in which the fixed-cost rate is calculated using practical capacity, but fixed costs are allocated to the cutting and welding department based on actual usage. Variable costs are allocated based on actual usage.
- (iv) Comment on your results in requirements (i), (ii) and (iii).

(CA, PE, Exam II, Group II, May 2003)

Solution:**Working Notes:**

1. Fixed practical capacity cost per machine hour:

Practical capacity (machine hours)	1,50,000
Practical capacity fixed costs (Rs.)	9,00,000
Fixed practical capacity cost per machine hour (Rs. 9,00,000/1,50,000 hours)	Rs. 6
2. Budgeted rate per machine hour (using practical capacity):

= Fixed practical capacity cost per machine hour + Budgeted variable cost per machine hour
= Rs. 6 + Rs. 4 = Rs. 10

- (i) Statement showing Power Plant's cost allocation to the Cutting and Welding departments by using single rate method on actual usage of machine hours.**

	<i>Cutting Department Rs.</i>	<i>Welding Department Rs.</i>	<i>Total Rs.</i>
Power plants cost allocation by using actual usage (machine hours) (Refer to Working Note 2)	6,00,000 (50,000 hours × Rs. 10)	4,00,000 (40,000 hours × Rs. 10)	10,00,000

(ii) Statement showing Power Plant's cost allocation to the Cutting and Welding departments by using dual rate method.

	<i>Cutting Department Rs.</i>	<i>Welding Department Rs.</i>	<i>Total Rs.</i>
Fixed Cost	5,40,000	3,60,000	9,00,000
(Allocated on practical capacity for each department that is, (90,000 hours: 60,000 hours)	$\left(\frac{\text{Rs. } 9,00,000 \times 3}{5} \right)$	$\left(\frac{\text{Rs. } 9,00,000 \times 2}{5} \right)$	
Variable cost (Based on actual usage of machine hours)	2,40,000 (60,000 hours × Rs. 4)	1,60,000 (40,000 hours × Rs. 4)	4,00,000
Total cost	7,80,000	5,20,000	13,00,000

(iii) Statement showing power plant's cost allocation to the cutting and welding Department using dual rate method

	<i>Cutting Department Rs.</i>	<i>Welding Department Rs.</i>	<i>Total Rs.</i>
Fixed Cost	3,60,000	2,40,000	6,00,000
Allocation of fixed cost on actual usage basis (Refer to Working Note 1)	(60,000 hours × Rs. 6)	(40,000 hours × Rs. 6)	
Variable cost (Based on actual usage)	2,40,000 (60,000 hours × Rs. 4)	1,60,000 (40,000 hours × Rs. 4)	4,00,000
Total cost	6,00,000	4,00,000	10,00,000

(iv) Comments:

Under dual rate method, under (iii) and single rate method under (i), the allocation of fixed cost of practical capacity of plant over each department are based on single rate. The major advantage of this approach is that the user departments are allocated fixed capacity costs only for the capacity used. The unused capacity cost Rs. 3,00,00 (Rs. 9,00,000 – Rs. 6,00,000) will not be allocated to the user departments. This highlights the cost of unused capacity.

Under (ii) fixed cost of capacity are allocated to operating departments on the basis of practical capacity, so all fixed costs are allocated and there is no unused capacity identified with the power plant.

Example 6.14

E-books is an online book retailer. The company has four departments. The two sales departments are corporate sales and consumer sales. The two support-departments are administrative (human resources accounting and information systems). Each of the sales department conducts merchandising and marketing operations independently.

The following data are available for October, 2003:

Departments	Revenues	Number of Employees	Processing Time used (in minutes)
Corporate Sales	Rs. 16,67,750	42	2,400
Consumer Sales	Rs. 8,33,875	28	2,000
Administrative	–	14	400
Information system	–	21	1,400

Cost incurred in each of four departments for October, 2003 are as follows:

Corporate Sales	Rs. 12,97,751
Consumer Sales	Rs. 6,36,818
Administrative	Rs. 94,510
Information Systems	Rs. 3,04,720

The company uses number of employees as a basis to allocate Administrative costs and processing time as a basis to allocate information systems costs.

Required:

- Allocate the support department costs to the sales departments using the direct method.
- Rank the support departments based on percentage of their services rendered to other support departments. Use this ranking to allocate support costs based on the step-down allocation method.
- How could you have ranked the support departments differently?
- Allocate the support department costs to two sales departments using the reciprocal allocation method.

(CA, PE, Exam II, Group II, Nov. 2003)

Solution:

(i)

Statement showing the allocation of support department costs to the sales departments (using the direct method)

Particulars	Basis of allocation	Sales department		Support department	
		Corporate sales Rs.	Consumer sales Rs.	Administrative Rs.	Information systems Rs.
Cost incurred		12,97,751	6,36,818	94,510	3,04,720
Re-allocation of cost of administrative department	Number of employees (6:4:-:-)	56,706	37,804	(94,510)	
Re-allocation of costs of information systems department	Processing time (6:5:-:-)	1,66,211	1,38,509		(3,04,720)
Total		15,20,668	8,13,131		

(ii)

Ranking of support departments based on percentage of their services rendered to other support departments

- Administration support department provides 23.077% $\left(\frac{21 \times 100}{42 + 28 + 1} \right)$ of its services to information systems support department. Thus 23.077% of Rs. 94,510 = Rs. 21,810
- Information system support department provides 8.33% $\left(\frac{400}{2,400 + 2,000 + 400} \times 100 \right)$ of its services to Administration support department. Thus 8.33% of Rs. 3,04,720 = Rs. 25,383.

Statement showing allocation of support costs (By using step-down allocation method)

Particulars	Basis of allocation	Sales department		Support department	
		Corporate sales Rs.	Consumer sales Rs.	Administrative Rs.	Information systems Rs.
Cost incurred		12,97,751	6,36,818	94,510	3,04,720
Re-allocation of cost of administrative department	Number of employees (6:4:-: -3)	43,520	29,080	(94,510)	21,810
Re-allocation of costs of information systems department	Processing time (6:5:-: -)	1,78,107	1,48,423		3,26,530
Total		15,19,478	8,14,321		

(iii) An alternative ranking is based on the rupee amount of services rendered to other service departments, using the rupee figures obtained under requirement (ii). This approach would use the following sequence of ranking.

- Allocation of information system overheads as first (Rs. 25,383 provided to administrative).
- Allocated administrative overheads as second (Rs. 21,810 provided to information systems).

(iv) Working Notes:

(1) Percentage of services provided by each service department to other service department and sales departments.

Particulars	Service departments		Sale departments	
	Administrative	Information system	Corporate Sales	Consumer Sales
Administrative	–	23.07%	46.16%	30.77%
Information systems	8.33%	–	50%	41.67%

(2) **Total cost of the support department:** (By using simultaneous equation method). Let *AD* and *IS* be the total costs of support departments Administrative and Information systems respectively. These costs can be determined by using the following simultaneous equations:

$$\begin{array}{ll}
 AD & = 94,510 + 0.0833 IS \\
 IS & = 3,04,720 + 0.2307 AD \\
 \text{or } AD & = 94,510 + 0.0833 \{3,04,720 + 0.2307 AD\} \\
 \text{or } AD & = 94,510 + 25,383 + 0.01922 AD \\
 \text{or } 0.98078AD & = 1,19,893 \\
 \text{or } AD & = \text{Rs. } 1,22,243 \\
 \text{and } IS & = \text{Rs. } 3,32,922
 \end{array}$$

**Statement showing the allocation of support departments costs to the sales departments
(Using reciprocal allocation method)**

Particulars	Sales department	
	Corporate sales Rs.	Consumer Sales Rs.
Costs incurred	12,97,571	6,36,818
Re-allocation of cost administrative department (46.16% and 30.77% of Rs. 1,22,243)	56,427	37,614
Re-allocation of costs of information systems department (50% and 41.67% of Rs. 3,32,922)	1,66,461	1,38,729
Total	15,20,639	8,13,161

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.

	<i>Job A</i> <i>(16 hr)</i>	<i>Job B</i> <i>(20 hr)</i>
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, that is, 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 (Rs. 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	

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

$$\text{Rate per unit of A} = 5 \times \text{Rs. } 10 = \text{Rs. } 50$$

$$\text{Rate per unit of B} = 7 \times \text{Rs. } 10 = \text{Rs. } 70$$

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 Hour 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, plants 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.

Arguments in Favour of Apportionment and Absorption of Overheads

The following are the arguments generally advanced in favour of apportionment and absorption of overheads:

1. Product Costing The process of apportionment and absorption helps in determining the total or full cost of a product and in turn assists in making product profitability analysis by comparing selling prices of different products with related full costs. Also, product cost can be used as a floor when fixing the price of a product.

2. Stock Valuation Apportionment and absorption facilitates inclusion of productions overhead in the valuation of work-in-progress and closing stock. For work-in-progress, the amount of production overhead

included indicates the degrees of completion of the products. Closing stock also rightly bears a share of manufacturing overhead. It is also clear that a proportion of manufacturing overhead is transferred to the next accounting period via work-in-progress and closing stock. Valuation of closing stock and work in progress in terms of full cost including production overhead is accepted for the purpose of financial reporting and by taxation and other regulatory authorities.

3. Production Overheads as Product Costs Apportionment and absorption of overheads achieves the objectives of recognising production overheads as product costs. It ensures the rationality that manufacturing of product requires incurrence of production overheads, and if manufacturing overhead is not incurred, production is not possible.

4. Cost Control Apportionment and absorption of overhead makes the centres or department managers aware about the costs they are considered to be accountable. Therefore, it develops a sense of responsibility among the production and service cost centre managers. These managers can relook at these costs which are being charged to their departments through budgeting process. Consequently, managers can take steps to control costs assigned to their departments.

5. Full costs used for government projects and activities In all government projects and govt-funded activities, full costs are considered including manufacturing overhead. Governments and development agencies also provide grants to cover the full costs. Audit process to verify full costs implies apportionment and absorption of overheads.

Limitations of Apportionment and Absorption

Apportionment and absorption of overheads are criticised on the following grounds:

- (1) Different methods of apportionment and absorption tend to charge varying amounts of manufacturing overheads to products and thus making the resulting product costs doubtful. Also, distribution of overheads based on different methods leads to inconsistencies and arbitrariness.
- (2) Since product costs themselves become unreliable and inaccurate, due to more or less arbitrary cost apportionment process, it cannot be used to set product price.
- (3) Those business firms which use one overall rate or a single plant wide rate instead of multiple rates of absorption may not find product cost data useful for planning, control and decision making.
- (4) Apportionment and absorption of overheads due to their underlying arbitrary methods may give product under-costing or product overcosting. In undercosting a product uses a relatively larger quantity of resources but is found to have a relatively low total cost. On the other hand, overcosting implies that a product consumes smaller quantity of resources but is shown to have higher costs.

Example 6.15

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) hours 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.

$$= 190 \times 6 \times 6 \times 2.50 = 17,100$$

Computation of Machine hours rate		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		12,000
(3% of value of machine p.a.)	$\frac{8,00,000 \times 3 \times 6}{100 \times 12}$	
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 =	$\frac{1,44,000}{5,760 \text{ Hrs}} = \text{Rs. 25 per hour}$	

Example 6.16

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. <u>Rs.</u>
Standing Charges per annum:	
Two operators wages along with two other machine = $\frac{5000 \times 12 \times 1}{3}$	20,000
Other overheads	10,431
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 $\times .50$	5.000
Machine hour rate	<u>27.999</u>

Example 6.17

X Ltd. having fifteen different types of automatic machines furnishes information as under:

- (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:

	<i>Work-order 31</i>	<i>Work-order 32</i>	
Machine set up time (Hours)	10	20	
Machine operation time (Hours)	90	180	
			<i>(CA Inter)</i>

Solution:

X Ltd. Computation of Comprehensive Machine Hour Rate of Machine B

	<i>Amount</i>	
	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 $\left(\frac{\text{Rs. 45,000} - \text{Rs. 5,000}}{10 \text{ Years}} \right)$		4,000
Annual Expenses on special equipment		3,000
		24,000
Fixed Cost per hour (Rs. 24,000/4,000 hrs.)		Rs. 6
		Rs. 6
<i>Particulars</i>	<i>Set up rate per hour Rs.</i>	<i>Operation rate per hour Rs.</i>
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 Rs.	Rate Rs.	Amount
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 6.18

(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

Particulars	Amount p.a. Rs.	Amount per quarter Rs.	Total per quarter Rs.
<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	

(Contd.)

(Contd.)

<i>Particulars</i>	<i>Amount p.a. Rs.</i>	<i>Amount per quarter Rs.</i>	<i>Total per quarter Rs.</i>
Power			
15 Units @ Rs. 3 for 600 hours (for a quarter)		27,000	45,500
<i>Standing Charges:</i>			
Rent, Rates and Taxes (@ Rs. 8,000 per quarter)		8,000	
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			65,500
Total Machine Hours for a quarter			600
Machine Hour Rate			Rs. 65,500
			= 600
			= 109.16

Working Notes:

1. Total Effective Machine Hrs. in a quarter = $13 \times 48 = 624$
 Less: Maintenance Stoppage = $8 \times 3 = 24$
600
 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 |
| | | Rs. 91.00 |

Example 6.19

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	
	3,116	
Hourly. 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		31.904

* 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

$$\text{Depreciation per hour: } \frac{4,95,000}{10 \text{ Year} \times 4,000} = \text{Rs. } 12.375$$

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

$$\text{Total annual insurance premium of the new machine: } \frac{4,500 \times 5,00,000}{75,00,000} = \text{Rs. } 300$$

3. <i>Rent for the Machine</i>	
Rent paid per annum	Rs. 9,600
Total area occupied	1600 sq. ft.

$$\text{Rent for the area occupied by the machine (100 sq. ft.) } \frac{9,600 \times 100}{1,600} = \text{Rs. } 600$$

4. *Lighting Charges for the Machine*

Total annual lighting charges of 20 points for the whole department Rs. 1,440

$$\text{Lighting charges of the machine p.a.: } \frac{\text{Rs. } 1,440 \times 3 \text{ points}}{20 \text{ points}} = \text{Rs. } 216$$

Example 6.20

Calculate machine hour rate from the following data:

Cost of machine	Rs. 1,16,000
Estimated scrap value	Rs. 16,000
Estimated working life	20,000 hrs.
Estimated maintenance cost during working life of machine	Rs. 2,400
Power used per machine	Re. 1 per hour
Rent rates per month (10% to be charged to machine)	Rs. 3,000
Normal machine running hours during a month	180
Standing charges other than rent, rates etc. per month	Rs. 400

(B.Com. Delhi, 2007)

Solution:

Calculation of Machine Hour Rate (180 × 12 = 2160 hrs)

<i>Standing Charges</i>	<i>Total</i>	<i>Machine Hours Rate</i>
Rent and Rates (3,000 × 12 × 10%)	3,600	
Other Standing charges (400 × 12)	4,800	
Total standing charges	<u>8,400</u>	
Per Hour standing charges $\frac{8400}{2160}$		3.89
<i>Running Charges</i>		
Depreciation $\frac{116,000 - 16,000}{20,000}$		5.00
Maintenance $\frac{2400}{20,000}$		0.12
Power		<u>1.00</u>
Machine Hour Rate		<u>10.01</u>

Example 6.21

From the following particulars, calculate machine hour rate:

- (i) Cost of machine Rs. 1,00,000
 Estimated life 10 years
 Scrap value Rs. 10,000
- (ii) Estimated working time 50 weeks of 44 hours each. It includes the following:
 Time taken up in maintenance 200 hrs.
 Setting up time 100 hrs.
 However, setting up time is regarded as productive time.

- (iii) Power used during production is 16 units per hour @ 9 paise per unit. No current is taken during maintenance or setting up time.
- (iv) The machine requires a chemical solution which is replaced at the end of each week at a cost of Rs. 20 each time.
- (v) Cost of maintenance Rs. 1,200 per annum.
- (vi) Two attendants control the operation of this machine together with five other identical machines. Their combined weekly wages amount to Rs. 120.
- (vii) General work overheads allocated to this machine for the year amount to Rs. 2,000.

(B.Com; Delhi, 2007, B.Com (Hons.) Delhi, 2006)

Solution:

Working Note:

Effective Machine Hours	Hrs.
Actual working hours 50 weeks × 44 hrs	2,200
Less: Time required for maintenance	<u>200</u>
Effective Machine Hours	<u>2000</u>

Computation of Machine Hour Rate

<i>Standing Charges</i>	Rs.
Overhead allocated to machine	2,000
Wages of attendants $\frac{120 \times 50}{6}$	1,000
Total Standing Charges	3,000
Hourly Rate of Standing Charges $\frac{3000}{2000}$	1.50
<i>Machine Expenses</i>	
Depreciation $\frac{1,00,000 - 10,000}{10 \times 2000}$	4.50
Repair and Maintenance $\left(\frac{1200}{2000}\right)$	0.60
Chemical $\left(\frac{20 \times 50}{2000}\right)$	0.50
Power $\left(\frac{1900 \times 16 \times 0.09}{2000}\right)$	1.37
Machine Hour Rate	<u>8.47</u>

Example 6.22

The following information relates to the activities of a production department for the month of January:

	Rs.
Materials used	72,000
Direct wages	60,000
Machine hours	20,000
Labour hours	24,000
Overhead chargeable to the deptt.	48,000

On one order to be carried out in the month of February, the relevant data were:

	Rs.
Materials	4,000
Direct wages	3,300
Machine hours	1,200
Labour hours	1,650

Prepare a comparative statement of cost of this order by using the following methods of absorption of overheads:

- (i) Direct labour hour rate
- (ii) Percentage of direct wages; and
- (iii) Machine hour rate.

(B.Com. (Hons), Delhi, 2003)

Solution:**(i) Direct Labour Hour Rate Method:**

$$\begin{aligned} \text{Direct Labour Hour Rate} &= \frac{\text{Overhead chargeable to the department}}{\text{Labour hours worked}} \\ &= \frac{48,000}{24,000} = \text{Rs. } 2 \end{aligned}$$

(ii) Percentage of Direct Wage Rate Method:

$$\begin{aligned} \text{Percentage of Direct Wages} &= \frac{\text{Overhead for the department}}{\text{Direct Wages}} \times 100 \\ &= \frac{\text{Rs. } 48,000}{\text{Rs. } 60,000} \times 100 = 80\% \end{aligned}$$

(iii) Machine Hour Rate Method:

$$\begin{aligned} \text{Machine Hour Rate} &= \frac{\text{Overhead for department}}{\text{Hours of machine operation}} \\ &= \frac{\text{Rs. } 48,000}{\text{Rs. } 20,000} = \text{Rs. } 2.40 \end{aligned}$$

Comparative Statement of Cost of Order

<i>Particulars</i>	<i>Direct labour hour rate</i>	<i>Percentage of direct wages</i>	<i>Machine hour rate</i>
	<i>(i)</i>	<i>(ii)</i>	<i>(iii)</i>
Material used	4,000	4,000	4,000
Direct wages	3,300	3,300	3,300
Prime Cost	7,300	7,300	7,300
(i) Rs. 2 per hour for 1650 labour hours	3,300	—	—
(ii) 80% of Rs. 3300 (i.e. Direct wages)	—	2,640	—
(iii) Rs. 2.40 per hour for 1,200 machine hours	—	—	2,880
Works Cost	10,600	9,940	10,180

Example 6.23

A machine shop in a factory has five machines of exactly similar type and specification. One operator is employed on each machine at Rs. 20 per hour. The factory works a 40-hour week which includes four hours for set-up time for each machine. The operators are paid fully for 40 hours. Cost are reported for the machine shop on the basis of thirteen four-weekly periods.

The following details applicable to the cost centre/machine are available:

1. Set up time is unproductive and no power is consumed during the set up time.
2. Original cost of machine is Rs. 1,30,000.
3. Depreciation on machine is to be provided at 10% per annum on original cost.
4. Maintenance and repairs per work per machine amounts to Rs. 25.
5. Consumable stores per week per machine amount to Rs. 27.
6. Power consumed is 10 units per hour per machine at 80 paise per unit.
7. Wages paid to the operators are considered as indirect.
8. Overheads apportioned to the cost centre are:

Rent	Rs. 3,000 p.a.
Heat and light	Rs. 4,000 p.a.
Misc. Expenses	Rs. 6,000 p.a.

You are required to calculate:

- (i) Cost of running one machine for a four-week period; and
- (ii) The machine hour rate.

(B.Com. (Hons), Delhi, 2005)

Solution:**Calculations of cost of Running One Machine for a Four week period.**

Standing Charges:	Rs.
1. Rent	3,000
2. Heat and Light	4,000
3. Sundry Exp.	6,000
Total Exp. of 5 Machines	<u>13,000</u>

Total Exp. for one machine for 4 week period

$= \frac{13,000}{5} \times \frac{4}{13}$	800
4. Wages of operator (40 × 4 × Rs. 20)	<u>3,200</u>
1. Total Standing charges (i)	<u>4,000</u>
(ii) Machine Expenses:	
1. Depreciation $\left(1,30,000 \frac{10}{100}\right) \times \frac{4}{13}$	4,000
2. Repairs and Maintenance (25 × 4)	100
3. Power (36 × 10 × .80)	<u>288</u>
Total Machine Expenses (ii)	<u>4,496</u>
Total Machine Exp. (i + ii)	<u>8,496</u>
2. Machine Hour Rate:	
= Total cost ÷ Total Productive Time	
= Rs. 8,496 ÷ 36 hrs × 4	
= Rs. 59 per effective productive hour	

Example 6.24

From the following data of textile factory machine room, compute an hourly machine rate, assuming that the machine room will work on 90% capacity throughout the year and that a breakdown of 10% is reasonable. There are three days holiday at Deepawali, 2 days at Holi and 2 days at Christmas exclusive of Sundays. The factory works 8 hours a day and 4 hours on Saturday. Number of machines (each of the same type)—40.

Expenses per annum:

	Rs.
Power	3,12,000
Light	64,000
Salaries to foreman	1,20,000
Lubricating oil	6,600
Repairs to machine	1,44,600
Depreciation	78,560
<i>(B.Com. (Hons), Delhi, 2006, 2007</i>	
<i>B.Com., Delhi, 2006)</i>	

Solution:

Computation of Machine Hour Rate

<i>Standing Charges</i>	<i>Rs.</i>	<i>Rs.</i>
		<i>Per Hour</i>
		<i>(80,640 hrs)</i>
Light	64,000	
Salaries to foreman	1,20,000	
Lubrication oil (Assumed fixed)	<u>6,600</u>	

	1,90,600	2.364
<i>Running Charges</i>	(3,12,000/80640)	3.869
Repair	(144600/80640)	1.793
Depreciation	(78,560/80,640)	0.974
Machine Hour rate		<u>9.000</u>
Machine Hour rate		

Working Note: Calculation of Effective Machine Hours

			(Hrs.)
Total Hours 365×8	=		2920
Less: Saturday only 4 hours works (52×4)	208		
Sundays Holiday (52×8)	416		
Holiday on Deepawali, Holi and Christmas			
($3 + 2 + 2$) $\times 8$	<u>56</u>	680	
Machine Hours worked		<u>2,240</u>	
Less: 10% Break Down (Normal)		224	
Effective Machine Hour per Machine		<u>2,016</u>	

Total Machine Hours = Effective Machine Hours per machine \times Number of machines

$$= 2,016 \times 40 = 80,640 \text{ Hrs.}$$

Example 6.25

A machine shop of Avon Ltd. has six identical machines manned by 6 operators. The machines cannot be worked without an operator wholly engaged on it. The cost of all these 6 machines including installation charges works out to Rs. 12 lakhs and these machines are deemed to have a scrap value of 10% at the end of its effective life (9 years). These particulars are furnished for a six months period.

Normal available hours per month	218
Absenteeism (without pay) hours	18
Leave (with pay) – hours	20
Stoppage for repairs and maintenance etc. hours	20
Average rate of wages per day of 8 hours	Rs. 80
Production bonus estimated	15% on wages
Value of power consumed	Rs. 24,150
Supervision and indirect labour	Rs. 9,900
Lighting and electricity	Rs. 4,800
These particulars are for a year:	
Repairs and maintenance including consumables	Rs. 36,000
Insurance	Rs. 60,000
Other sundry works expenses	Rs. 36,000
General management expenses allocated	Rs. 1,09,040

You are required to work out a comprehensive machine hour rate for the machine shop.

(I.C.W.A. Inter, Stage 1, June 2005)

Solution:

AVON LTD.

(1) Computation of total Machine hours utilised:

Normal available hours p.m. per operator:		218 hours
Less: Unutilised hours due to:		
Absenteeism	18 hours	
Leave	20	
Stoppage for repairs and maintenance etc.	20	58
Total hours utilised p.m. per operator		160
Total hours utilised for 6 months for 6 operator: $160 \times 6 \times 6$		= 5760 hours

It is given in the question that the machine cannot work without an operator wholly engaged on it. Therefore, hours utilised for six operators that is, 5760 hours represent the total machine hours.

(2) Total wage to 6 operators for six months:

- Average rate of wages per hour = Rs. 80/8 = Rs. 10
- Normal hours for which wages are to be paid: $218 - 18 = 200$ hours.
- Wages for 6 months for 6 operators @ Rs. 10 = $200 \times 6 \times 6 \times 10 =$ Rs. 72,000.

Computation of Comprehensive Machine Hour Rate for the Machine Shop

		Rs.
Operator Wages (Ref: W-2)	(for six months)	72,000
Production Bonus (15% of wages)	"	10,800
Power consumed	"	24,150
Supervision and Indirect Labour	"	9,900
Lighting and Electricity	"	4,800
Repair and maintenance (36000/2)	"	18,000
Insurance (60000/2)	"	30,000
Depreciation for 6 months [(12 lakhs - 1.20 lakhs)/9]/2	"	60,000
Other Sundry works Expenses for 6 months		18,000
General Management Expenses for 6 months		54,520
Total overheads for six months		3,02,170
Comprehensive Machine hour Rate (302170/5760)		52.46

Example 6.26

Calculate the comprehensive Machine Hour Rate of a machine from the following:

- (i) Cost of the machine Rs. 25 lakhs, having a scrap value of Rs. 1 lakh after 10 years.
- (ii) The machine will be operated for three shifts of 7 hrs. each for 300 working days in a year of which 300 hrs. will be utilised for minor repairs and maintenance.
- (iii) Wages payable: Rs. 8,000 p.m. for an operator and Rs. 3,000 p.m. for a helper for every shift. Rs. 16,000 per month to one supervisor per shift for the department accommodating four machines including the above machine.

(iv) Other details	:	
Power consumption	:	25 units (kWh @ Rs. 4.80 per unit)
Repairs and maintenance	:	Rs. 30,000 per annum
General lighting and heating	:	Rs. 4,000 p.m. for the whole department having the four machines
Insurance	:	Rs. 18,000 per machine per annum
Rent, Rates and Taxes	:	Rs. 3,000 p.m. for the department
Factory overhead	:	Rs. 36,000 per annum for the department

(I.C.W.A., Inter, Stage I, June 2007,

Solution:**Computation of Comprehensive Machine Hour Rate**

Cost: Rs. 25,00,000	Annual Working Hours (300 × 7 × 3)	6,300
Life: 10 years, scrap value: Rs. 1,00,000	Less: for minor repair and maintenance	300
Depreciation: Rs. 2,40,000 p.a.	Net working hours	<u>6,000</u>
<i>(i) Running Expenses:</i>		
	Per annum (Rs.)	Per hour (based on 6000 hours) (Rs.)
Wages to operators: 3 × Rs. 8,000 × 12	2,88,000	48
Wages to helper: 3 × Rs. 3,000 × 12	1,08,000	18
Power: 6,000 × 25 × Rs. 4.80	7,20,000	120
Repairs and Maintenance	<u>30,000</u>	<u>5</u>
	<u>11,46,000</u>	<u>191</u>
<i>(ii) Fixed Expenses:</i>		
Supervisor's Salary: Rs. $\frac{16,000 \times 12 \times 3}{4}$	1,44,000	24
General lighting and heating Rs. $\frac{4000 \times 12}{4}$	12,000	2
Insurance	18,000	3
Rent, Rates and Taxes Rs. $\frac{3000 \times 12}{4}$	9,000	1.50
Factory Overhead Rs. $\frac{3600}{4}$	9,000	1.50
Depreciation	<u>2,40,000</u>	<u>40</u>
	<u>4,32,000</u>	<u>72</u>
Total	<u>15,78,000</u>	<u>263</u>

Comprehensive Machine Hour Rate: Rs. 263

Example 6.27

In a factory, a machine is considered to work for 208 hours in a month. It includes maintenance time of 8 hours and set up time of 20 hours.

The expense data relating to the machine are as under:

– Cost of the machine is Rs. 5,00,000. Life 10 years. Estimated scrap value at the end of life is Rs. 20,000.	
	Rs.
– Repairs and maintenance per annum	60,480
– Consumable stores per annum	47,520
– Rent of building per annum (The machine under reference occupies 1/6 of the area)	72,000
– Supervisor's salary per month (Common to three machines)	6,000
– Wages of operator per month per machine	2,500
– General lighting charges per month allocated to the machine	1,000
– Power 25 units per hour at Rs. 2 per unit	

Power is required for productive purposes only. Set up time, though productive, does not require power. The Supervisor and Operator are permanent. Repairs and maintenance and consumable stores vary with the running of the machine.

Required

Calculate a two-tier machine hour rate for (a) set up time, and (b) running time.

(CA, PE, Exam II, Group II, May 2003)

Solution:

Computation of Machine Hour Rate

Working Notes:

(i) Effective hours for standing charges (208 hours – 8 hours)	200
(ii) Effective hours for variable costs (208 hours – 28 hours)	180

1. *Standing charges per hour*

	Per month Rs.	Per hour Rs.
Supervisor's salary (Rs. 6,000/3 machines)	2,000	
General Lighting	1,000	
Rent (Rs. 72,000/6 × 12)	1,000	
Total standing charges	4,000	
Standing charges per hour (Rs. 4,000/200 hours)		20

2. Machine expenses per hour

	Per month Rs.	Per hour Rs.
Depreciation (Rs. 5,00,000 – Rs. 20,000)/ (10 years × 12 months)	4,000	20 (Rs. 4,000/200 hours)
Repairs and maintenance (Rs. 60,480/12 months)	5,040	28 (Rs. 5,040/180 hours)
Consumable stores (Rs. 47,520/12 months)	3,960	22 (Rs. 3,960/180 hours)
Power (25 units × Rs. 2 × 180 hours)	9,000	50 (Rs. 9,000/180 hours)
Wages	2,500	12.50 (Rs. 2,500/200 hours)
Total machine expenses	<u>24,500</u>	<u>132.50</u>

Computation of Two-tier machine hour rate

	Set up time rate per machine hour Rs.	Running time rate per machine hour Rs.
Standing Charges (Refer to Working Note 2)	20.00	20.00
Machine expenses (Refer to Working Note 3)		
Depreciation	20.00	20.00
Repair and maintenance	--	28.00
Consumable stores	--	22.00
Power	--	50.00
Machine hour rate of overheads	40.00	<u>140.00</u>
Wages	12.50	12.50
Comprehensive machine hour rate	<u>52.50</u>	<u>152.50</u>

Example 6.28

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)	Maximum Capacity: Total Days in 1996 × Single eight hours shift: = 366* × 8	<u>2,928</u>
(ii)	Practical Capacity: Maximum Capacity Less: 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	Hours 2,928 828 <u>2,100</u>
(iii)	Normal Capacity: (Normal Production and Sales expected) ÷ Rate of Production per hour = (1,60,000 ÷ 80 units)	<u>2,000</u>
(iv)	Actual Capacity: Actual capacity utilised: (Total Production ÷ Hourly Rate of Production) = 1,46,000 ÷ 80	1,825

(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 (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) $5,84,000/2,928 = \text{Rs. } 199.45$
- (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	Amount Rs.
(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 6.29

In an engineering company, the factory overheads are recovered on 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 Rs.	Job 102 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:

- Computation of percentage recovery rates of factory overheads and administrative overheads:
- Calculation of the amount of factory overheads, administrative overheads and profit for each of the two jobs.
- 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 ½ %

(CA Inter, May 1995)

Solution:

- 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

$$96,000 + 420x + y/100 (96,000 + 420x) \\ = 96,000 + 420x + 960y + 4.20xy$$

Total Cost of Production of Job 102

$$67,500 + 300x + y/100 (67,500 + 300x) \\ = 67,500 + 300x + 675y + 3xy$$

Thus,

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

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

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

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

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

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

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

$$15y = 375$$

or $y = 25$

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

On substituting the value of y in Eq. (1)

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

or $420x + 24,000 + 105x = 55,500$

or $525x = 31,500$

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> Rs.	<i>Job 102</i> Rs.
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 Re. 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 6.30

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:

<i>Unabsorbed Overheads</i>	
Overheads recovered from production $2,84,756 \times 2 =$	5,69,512
Actual Overheads	<u>6,75,912</u>
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 (that is, 60% of Rs. 1,06,400) should therefore be charged to units produced by means of supplementary rate.

$$\text{Supplementary Rate} = \left(\frac{63,840}{10,500} \right) = \text{Rs. } 6.08$$

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 × 6.08)	= 48,640
Finished Goods A/c	(2,000 × 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 6.31

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

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
	<u>4,80,000</u>	<u>20,000</u>	<u>5,00,000</u>

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 6.32

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 (that is, 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	<u>5,000</u>
Total Units	<u>40,000</u>

Supplementary Overhead Absorption Rate comes to:

$$= \left(\frac{\text{Rs. } 2,00,000}{40,000} \right) = \text{Rs. } 5 \text{ per unit}$$

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

	Rs.
(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, that is, 5,000 equivalent units @ Rs. 5 per unit	<u>25,000</u>
Total	<u>2,00,000</u>

Example 6.33

The budgeted activity and cost data for each half year of S.V. Ltd. were as follows:

Direct labour hours	68,000
Direct wages	Rs. 42,500
Overhead:	
Fixed	Rs. 37,400
Variable	Rs. 64,600

During the 6 months January to June the following actual results were achieved:

Direct labour hours incurred	65,000
Direct wages	Rs. 45,500
Overhead:	
Fixed	Rs. 38,700
Variable	Rs. 65,800

The existing method of absorbing overhead is by a direct wages percentage rate. A proposal has been made to change the overhead absorption to a direct labour hour rate analyzed into fixed and variable overhead.

You are required for the period January to June to calculate under the new proposal (that is, using direct labour hour rates of absorption):

- (i) the budgeted direct labour hour rates of overhead absorption for fixed and variable overheads;
- (ii) the absorbed overhead;
- (iii) the over- or under-absorbed overhead.

(B.Com. (Hons), Delhi, 2002)

Solution:

Fixed Overhead Rates on the basis of direct wages percent rate

$$= \frac{37,400}{42,000} \times 100 = \text{Rs. } 88\%$$

Variable overhead on the basis of direct wage percentage rate

$$= \frac{64,600}{42,500} \times 100 = 152\%$$

(i) Fixed Overhead rates on the basis of direct labour

$$= \frac{\text{Fixed overhead}}{\text{Direct labour hours}} \times 100$$

$$= \frac{37,400}{68,000} \times 100 = 55\%$$

Variable overhead rate on the basis of direct labour hours

$$= \frac{\text{Variable overhead}}{\text{Direct labour hours}}$$

$$= \frac{64,600}{68,000} \times 100 = 95\%$$

(ii) Absorbed overhead in actual result

Fixed overhead = Actual labour hours × Fixed overhead rate

$$= \frac{65,000 \times 55}{100} = \text{Rs. } 35,750$$

Variable overhead = Actual labour hours × Variable overhead

$$\frac{65,000 \times 95}{100} = \text{Rs. } 61,750$$

(iii) Fixed overhead = Rs. 35,700 – 38,700 = –3,000

Fixed overheads are under absorbed

Variable overhead = Rs. 61,750 – 65,800 = –4,050

Variable overheads are under-absorbed.

Example 6.34

A company absorbs production overheads on the basis of predetermined machine hour rate. For the month of March 2004 the budgeted machine hours were 8,500. During the month the actual machine hours worked were 7,928 actual overheads were Rs. 1,46,200 and there was under absorption of Rs. 7,460.

Ascertain the budgeted level of overheads for the month.

(B.Com. (Hons), Delhi, 2004)

Solution:

Budgeted Machine hours	8500
Actual Machine hours worked	7928

Over-absorption of Machine Hour	572
Actual Overhead	Rs. 1,46,200
Less under-absorption	Rs. 7,460
Budgeted overhead for month of March	Rs. 1,38,740

Example 6.35

The following particulars are available in respect of a department of a concern for a month.

Actual overhead expenses Rs. 1,00,000 (including Rs. 20,000 paid one time on account of an old claim).

Actual machine hours worked 10,000 hrs.

Predetermined overhead recovery rate— Rs. 6 machine hour.

On analysis of under-absorbed overheads it was noted that 70% of under-absorption is due to defective planning and 30% is due to increase in expenditure. The department produced 20,000 units in the month, out of which 15,000 units were sold and 5,000 units remained in stock.

You are required to show treatment of under or over-absorbed overheads in cost accounts.

(B.Com. (Hons), Delhi, 2006)

Solution:

Actual overhead (1,00,000 – 20,000)	Rs. 80,000
Pre determined overhead (10,000 × Rs. 6)	60,000
Under absorption of overhead	20,000

Reasons for under absorption of overhead:

$$\text{Defective Planning} \left(20,000 \times \frac{70}{100} \right) = \text{Rs. } 14,000$$

$$\text{Increase in Expenditure} \left(20,000 \times \frac{30}{100} \right) = \text{Rs. } 6,000$$

→ Under recovery of Rs. 14,000 is due to defective planning being abnormal, should be transferred to costing profit and loss A/c.

→ Under recovery of Rs. 6,000 is due to increase in expenditure will be recovered from cost of sales A/c and finished goods stock A/c in the ratio of 15,000 : 500 that is, 3 : 1.

$$\text{So, Amount charged to cost of sales} = 6,000 \times \frac{15,000}{20,000} = \text{Rs. } 4,500$$

$$\text{Finished goods stock A/c} = 6,000 \times \frac{5,000}{20,000} = \text{Rs. } 1,500$$

Example 6.36

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,

- (a) 50,000 direct labour hours are worked and the actual overheads were Rs. 94,000.
- (b) 43,000 direct labour hours are worked and the actual overheads were Rs. 100,000.
- (c) 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;	Rs. 94,000
Over-absorbed	Rs. 6,000

The reason for this over-absorption is expenditure, that is, actual cost are less than anticipated.

(b) Recovered overheads (43,000 hours × Rs. 2)	Rs. 86,000
Actual overheads incurred:	Rs. 100,000
Under-absorbed	Rs. 14,000

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

(c) Recovered overheads (43,000 hours × Rs. 2)	Rs. 86,000
Actual overheads incurred:	Rs. 94,000
Under-absorbed	Rs. 8,000

The reason for this under-absorption is two fold:

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

Over-absorbed and under-absorbed overheads are charged to the profit and loss account via an under-absorbed/over-absorbed overhead account. Over-absorbed overheads will be credited to the profit and loss account, and under-absorbed overheads will be debited to it.

Example 6.37

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
<i>Reasons for unabsorbed overheads</i>	
(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

1. 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:

	Rs.
Cost of sales (7,000 units × Rs. 5)	35,000
Finished goods (800 units × Rs. 5)	4,000
Work-in-progress (200 units × Rs. 5)	1,000
	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 that is, Rs. 40,000 due to factory inefficiency should be charged to costing profit and loss account, as this is an abnormal loss.

Example 6.38

A factory has three production departments. The policy of the factory is to recover production overheads of the entire factory by adopting a single blanket rate based on the percentage of total factory overheads to total factory wages. The relevant data for a month are given below:

Department	Direct materials (Rs.)	Direct wages (Rs.)	Factory overheads (Rs.)	Direct labour hour	Machine hours
Budget					
Machining	6,50,000	80,000	3,60,000	20,000	80,000
Assembly	1,70,000	3,50,000	1,40,000	1,00,000	10,000
Packing	1,00,000	70,000	1,25,000	50,000	—
Actuals					
Machining	7,80,000	96,000	3,90,000	24,000	96,000
Assembly	1,36,000	2,70,000	84,000	90,000	11,000
Packing	1,20,000	90,000	1,35,000	60,000	—

The details of one of the representative jobs produced during the month are as under:

Job No. CW 7083

Department	Direct materials	Direct wages	Direct labour hours	Machine hours
Machining	Rs. 1,200	Rs. 240	60	180
Assembly	600	360	120	30
Packing	300	60	40	—

The factory adds 30% on the factory cost to cover administration and selling overheads and profit.

Required:

- (i) Calculate the overhead absorption rate as per the current policy of the company and determine the selling price of job (No. CW 7083).
- (ii) Suggest any suitable alternative method(s) of absorption of factory overheads and calculate the overhead recovery rates based on the method(s) so recommended by you.
- (iii) Determine the selling price of job (No. CW 7083) based on the overhead application rates calculated in (ii) above.
- (iv) Calculate the department-wise and total under- or over-recovery of overheads based on the company's current policy and the method(s) recommended by you. (CA, Inter)

Solution:

Computation of Overhead Absorption Rate as Per Current Policy

- (i) Total budgeted overheads: (Rs. 3,60,000 + 1,40,000 + 1,25,000) = Rs. 6,25,000
- (ii) Total budgeted factory wages: (Rs. 80,000 + 3,50,000 + 70,000) = Rs. 5,00,000
- (iii) Overhead absorption rate = (Rs. 6,25,000/Rs. 5,00,000) × 100 = 125% of direct wages.

Selling price of the job (No. CW 7083)

Direct material		Rs. 2,100.00
Direct wages		660.00
Factory overheads	125% × Rs. 660	825.00
Total factory cost		Rs. 3,585.00
Add mark-up	0.30 × Rs. 3,585	1,075.00
	Selling price	Rs. 4,660.00

Alternative Methods for Absorbing Factory Overheads

Machining department: The appropriate rate is the machine-hour rate.

Machine-hour rate = Rs. 3,60,000/80,000 = Rs. 4.50 per hour

Assembly department: The labour-hour rate is appropriate, because labour is predominant.

Labour-hour rate = Rs. 1,40,000/1,00,000 = Rs. 1.40 per hour

Packing department: The labour-hour rate is appropriate because labour is predominant.

Labour-hour rate = Rs. 1,25,000/50,000 = Rs. 2.50 per hour

Selling price of the job (No. CW 7083)

Direct material		Rs. 2,100.00
Direct wages		660.00
Factory overheads	Machining 180 × Rs. 4.50	Rs. 810.00
	Assembly 120 × Rs. 1.40	168.00
	Packing 40 × Rs. 2.50	100.00
		1,078.00
Factory cost		Rs. 3,838.00
Add mark-up: 0.30 × Rs. 3838.00		1,151.40
Selling price		Rs. 4,989.40

Departmentwise Under/Over Recovery of Overheads

		Rs.
<i>Under existing policy</i>		
Machining:	Overheads recovered 125% × Rs. 96,000	1,20,000
Actual overheads		3,90,000
	Under recovery (Rs. 3,90,000 – 1,20,000)	<u>2,70,000</u>
Assembly:	Overheads recovered 125% × Rs. 2,70,000	3,37,500
Actual overheads		84,000
	Over-recovery (Rs. 3,37,500 – 84,000)	<u>2,53,500</u>
Packing:	Overheads recovered 125% × Rs. 90,000	1,12,500
Actual overheads		1,35,000
	Under-recovery (Rs. 1,35,000 – 1,12,500)	<u>22,500</u>
Total (under-recovery)		<u>39,000</u>
<i>As per methods suggested</i>		
Machining:	Overheads recovered 96,000 × Rs. 4.50	4,32,000
Actual overheads		3,90,000
	Over-recovery (Rs. 4,32,000 – 3,90,000)	<u>42,000</u>
Assembly:	Overheads recovered 90,000 × Rs. 1.40	1,26,000
Actual overheads		84,000
	Over-recovery (Rs. 1,26,000 – 84,000)	<u>42,000</u>
Packing:	Overheads recovered 60,000 × Rs. 2.50	1,50,000
Actual overheads		1,35,000
	Over recovery (Rs. 1,50,000 – 1,35,000)	<u>15,000</u>
Total (over-recovery)		<u>99,000</u>

THEORY QUESTIONS

1. Explain the general principles to be kept in mind while considering whether item of expenditure is to be treated as overhead.
(B.Com. (Hons) Delhi, 2002)
2. Differentiate between apportionment and absorption of overhead.
(B.Com. (Hons), Delhi, 2003)
3. What is the importance of machine hour as a basis for the absorption of factory overheads?
(B.Com. (Hons), Delhi, 2004)
4. Explain briefly various methods of absorption of factory overheads.
(B.Com. (Hons), Delhi, 2004)
5. What do you mean by over-absorption and under-absorption of overheads? How would you treat such over and under absorbed factory-overheads in cost accounts?
(ICWA Inter, Stage I, June 2005, Dec. 2006)
B.Com. (Hons), Delhi, 2007, CA, PE, Exam II, May 2004)
6. Distinguish between allocation, apportionment and absorption of overheads.

- (B.Com. (Hons), Delhi, 2006, 2007)*
7. What are the requisites of a good method of absorption of factory overhead?
 8. Explain how would you treat under/overabsorption of overheads in cost accounts. *(B. Com. (Hons), Delhi 1997)*
 9. Discuss the secondary distribution of overheads. *(B. Com. (Hons), Delhi 1997)*
 10. Describe the different bases on which factory expenses can be apportioned. Describe the merits and suitability of each of them.
 11. Write a detailed critical note on the direct labour cost method of absorption of factory overheads. *(B. Com. (Hons), Delhi)*
 12. 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)*
 13. Explain the concept of absorption of factory overheads. *(B. Com. (Hons), Delhi)*
 14. What do you understand by classification, allocation and apportionment in relation to overhead expenses? Explain fully. *(ICWA Inter)*
 15. 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)*
 16. 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)*
 17. Overhead costs are usually classified according to variability. What are the necessities for such classification and what purpose do such classifications serve. *(ICWA Inter)*
 18. State in short the reasons for the use of predetermined rates for factory overhead absorption. *(B. Com. (Hons), Delhi)*
 19. 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)*
 20. Why do you consider departmentalisation of overheads necessary? *(B. Com. (Hons), Delhi)*
 21. 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*.
 22. Explain the different methods for apportionment of Service Department's cost over Production Departments. *(B. Com. (Hons), Delhi)*
 23. 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)*
 24. What are the causes of under/over absorption of factory overheads? How will you deal with them in cost accounts? *(B. Com. (Hons), Delhi)*

SELF-EVALUATION QUESTIONS

Select the correct answer for the following multiple choice questions:

- (i) Factory overhead includes
 - (a) All manufacturing costs
 - (b) All manufacturing costs except direct materials and direct labour
 - (c) Indirect materials but not indirect labour
 - (d) 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
 - (a) does not have a cause and effect relationship
 - (b) has a cause and effect relationship
 - (c) considers variable costs but not fixed costs
 - (d) 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 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:
 - (a) overhead costs
 - (b) prime costs
 - (c) variable costs
 - (d) total costs
- (xiii) Indirect costs which cannot be identified with a particular cost centre are shared out between cost centres using:
 - (a) a recovery rate
 - (b) an absorption rate
 - (c) a method of apportionment
 - (d) a method of allocation
- (xiv) Which of the following is not an indirect cost?
 - (a) wages of production department machine operator
 - (b) wages of a production department cleaner
 - (c) materials used for machine maintenance in the production department
 - (d) materials used to clean the production department floor

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
		38,000

The other information are:

<i>Particulars</i>	<i>Production departments</i>		<i>Service departments</i>		
	<i>X</i>	<i>Y</i>	<i>Time-keeping</i>	<i>Stores</i>	<i>Maintenance</i>
No. of employees	40	30	20	16	10
No. of stores requisitions	24	20	—	—	6
Machine-hours	2,400	16,000	—	—	—

You are required to make departmental allocation of expenses.

Ans: Total overhead costs
 Deptt. X Rs. 22,845
 Deptt. Y Rs. 15,155

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 P_1 , P_2 , P_3 and two Service Departments S_1 and S_2 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 P_1 , P_2 and P_3 for 4, 5 and 3 hours respectively, given that its Direct Material Cost is Rs. 50 and Direct Labour Cost Rs. 30. (CA Inter)

Ans: Total Cost of Product X Rs. 117.25.

4. 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. (CA Inter)

Ans: Total overhead of service deptt. D Rs. 4,625 and E Rs. 1,575. Overhead rates Deptt. A Rs. 1.50; Deptt. B Rs. 2.25; and C Rs. 3.00.

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
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	—	—

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

	<i>A</i>	<i>B</i>	<i>C</i>	<i>P</i>	<i>Q</i>
<i>P</i>	30%	40%	20%	—	10%
<i>Q</i>	10%	20%	50%	20%	—

(CA Inter)

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

6. 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	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
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:

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>D</i>	40	20	30	—	10
<i>E</i>	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

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 basis:

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

You are required to:

- (i) Apportion the power generation plant costs to the four departments.
- (ii) Re-apportion service department cost to production departments.
- (iii) 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)

Ans: Overhead rate per direct labour hour Deptt. PD₁ Rs. 10.87, PD₂ Rs. 12.43

8. 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)

Ans: (i) Rs. 4,00,000 (ii) Rs. 3,200 (iii) Rs. 2880

9. 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)	Direct labour hours	Direct labour cost
	Rs.		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':

Unit Produced	Deptt. X	Deptt. Y	Deptt. Z
	Rs.	Rs.	Rs.
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)

Ans: (a) Deptt. rate, Deptt X = Rs. 1.55, Deptt. Y Rs. 2.00, Deptt. Z Rs. 5.20 Plant wide rate Rs. 3
(b) Cost Plantwide Rs. 2,50,000; Deptt. rates X, Rs. 60,500; Y, Rs. 20,500; Z Rs. 2,15,500.

10. Superclass Co. Ltd. has three production departments, X, Y and Z, and two service departments, A and B. The following estimated figures for a certain period have been made available:

	Rs.
Rent and rates	10,000
Lighting and electricity	1,200
Indirect wages	3,000
Power	3,000
Depreciation of machinery	20,000
Other expenses and sundries	20,000

The following details are provided by the firm:

	Total	X	Y	Z	A	B
Floor space (sq. mt.)	10,000	2,000	2,500	3,000	2,000	500
Lighting point (nos.)	120	20	30	40	20	10
Direct wages (Rs.)	20,000	6,000	4,000	6,000	3,000	1,000
Horsepower of machines	300	120	60	100	20	—
Cost of machinery (Rs.)	1,00,000	24,000	32,000	40,000	2,000	2,000
Working hours	—	4,670	3,020	3,050	—	—

The expenses of the service departments A and B are to be allocated as follows:

	X	Y	Z	A	B
A	20%	30%	40%	—	10%
B	40%	20%	30%	10%	—

You are required to calculate the overhead absorption rate per hour in respect of the three production departments. What will be the total cost of an article with material cost of Rs. 80 and direct labour cost of Rs. 40 which passes through X, Y and Z for 2, 3 and 4 hours respectively.

(ICWA, Inter)

Ans: Total cost Rs. 178.09

11. A company has three production centres, *A*, *B* and *C* and two service cost centres, *X* and *Y*. Costs allocated to service centres are required to be apportioned to the production centres to find our cost of production of different products. It is found that benefit of service cost centres is also received by each other along with the production cost centres.

Overhead costs as allocated to the five cost centres and estimates of benefit of service cost centres received by each of them are as under:

Cost centres	Overhead costs as allocated (Rs.)	Estimates of benefits received from service centres (%)	
		X	Y
<i>A</i>	80,000	20	20
<i>B</i>	40,000	30	25
<i>C</i>	20,000	40	50
<i>X</i>	20,000	—	5
<i>Y</i>	10,000	10	—

Required: Work out final overhead costs of each of the production departments including reapportioned cost of service centres using (a) continuous distribution method and (b) simultaneous equation method. (ICWA, Inter)

Ans: Total overhead costs, Deptt. *A* Rs. 86,533, Deptt. *B* Rs. 49,196, Deptt *C* Rs. 34271.

12. Following particulars have been extracted from the books of Reliable Co.:

Indirect materials

Shop no. 1	Rs. 12,000	
Shop no. 2	18,000	
Shop no. 3	6,000	
Tool room	3,600	
Stores	4,800	
Factory office	1,800	
		Rs. 46,200

Indirect wages

Shop no. 1	12,600	
Shop no. 2	17,600	
Shop no. 3	16,000	
Tool Room	11,100	
Stores	4,500	
Factory office	6,600	
		68,400
Factory rent		30,000
Insurance		6,000
Depreciation 10%		30,000
Power		27,000
Light and heat		12,000
Total		Rs. 2,19,600

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Further information regarding the operations is given below:

Departments	Area (sq. m)	Book value of machinery (Rs.)	Effective HP	Direct labour		Machinery hours
				Hours	Cost (Rs.)	
Production:						
Shop no. 1	1,000	75,000	90	3,00,000	90,000	1,60,000
Shop no. 2	750	1,35,000	90	3,00,000	60,000	2,40,000
Shop no. 3	1,500	30,000	—	2,00,000	50,000	
Service:						
Tool room	500	45,000	20	—	50,000	—
Stores	750	7,500	—	—	—	—
Factory office	500	7,500	—	—	—	—
	5,000	3,00,000	200	8,00,000	2,50,000	4,00,000

You are required to prepare an 'overhead analysis sheet' for the departments of Reliable Co. for the year showing the basis for apportionment. (ICWA, Inter)

Ans: Total Cost Shop 1 Rs. 73,760, Shop 2 Rs. 98,540, Shop 3 Rs. 47,300

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:

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

Other Budgeted Data

Labour hours for the period	2,500
Machine hours for the period	1,500
No. of jobs for the period	300

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	4,500
Labour hours required	= 80
Machine hours required	= 50

You are required to:

(a) Calculate by different methods, six overhead absorption rates for absorption of production overhead and comment on the suitability of each.

- (b) Calculate the production overhead cost of the order based on each of the above rates.
 (c) Give your recommendation to the company.

(ICWA Inter, Dec. 1997)

Ans: Production overhead cost for the job

Direct labour hour rate	Rs. 9,600
Machine hour rate	Rs. 10,000
Direct material cost percentage	Rs. 7,500
Direct labour cost percentage	Rs. 12,000
Prime cost percentage	Rs. 9,000
Job Rate	Rs. 10,000

14. 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. 915.66

15. 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

16. 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.)

(Countd.)

	Total	A	B	C
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:
Deptt. A = Rs. 53.50; B = 63.67; C = Rs. 58.63.

17. From the following data, work out the predetermined machine-hour rates for departments A and B of a factory:

Preliminary Estimates of Expenses

	Total (Rs.)	Deptt. A (Rs.)	Deptt. B (Rs.)
Power	15,000	—	—
Spare parts	8,000	3,000	5,000
Consumable stores	5,000	2,000	3,000
Depreciation on machinery	30,000	10,000	20,000
Insurance on machinery	3,000	—	—
Indirect labour	40,000	—	—
Building maintenance	7,000	—	—

The final estimates are to be prepared on the basis of above figures after taking into consideration the following factors:

- An increase of 10 per cent in the price of spare parts;
- An increase of 20 per cent in the consumption of spare parts for department B only;
- Increase in straight line method of depreciation from 10 per cent on the original value of machinery to 12 per cent;
- 15 per cent general increase in wage rates.

The following information is available:

	Deptt. A	Deptt. B
Estimated direct labour-hours	80,000	1,20,000
Ratio of kW ratings	3	2
Estimated machine-hours	25,000	30,000
Floor space (sq. ft)	15,000	20,000

(ICWA, Inter)

Ans: Machine hour rate, Deptt. A Rs. 1.948, Deptt-B Rs. 2.440

18. 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:

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

19. During the year ended 31st March 1993, the factory overhead costs of three production departments of an organisation are as under:

Department X	Rs. 48,950
Y	Rs. 89,200
Z	Rs. 64,500

The basis of apportionment of overhead is given below:

Department X	Rs. 5.00 per machine hour for 10,000 hours
Y	75% of direct labour cost of Rs. 1,20,000
Z	Rs. 4.00 per piece for 15,000 pieces

Calculate department-wise under or over-absorption of overheads and present the data in a tabular Form?

(ICWA, Inter)

Ans: Deptt. X Rs. 1050 (Over), Deptt. Y, Rs. 800 (Over), Deptt. Z Rs. 4,500 (under)

20. In a factory, overheads of a particular department are recovered on the basis of Rs. 5 per machine hour. The total expenses incurred and the actual machine hours for the department for the month of August were Rs. 80,000 and 10,000 hours, respectively. Of the amount of Rs. 80,000, Rs. 15,000 became payable due to an award of the labour court Rs. 5,000 was in respect of expenses of the previous year booked in the current month (August). Actual production was 40,000 units, of which 30,000 units were sold. On analysing the reasons, it was found that 60 per cent of the under-absorbed overhead was due to defective planning and the rest was attributed to normal cost increase. How would you treat the under-absorbed overhead in the cost accounts? (CA, Inter Year)

Ans: Rs. 6000 (under-absorption) should be transferred to costing profit and loss A/c as it is abnormal in nature. The other Rs. 4,000 will be treated as: Cost of sales Rs. 3,000; Finished goods Rs. 1,000.

21. A manufacturing company has four production departments. Overhead is absorbed to its production departments by means of departmental rates per direct labour hour. In a particular year there was a large difference between the overhead incurred and overhead absorbed. On analysis, you get the following information:

	(in Rs.)			
	Departments			
	1	2	3	4
Overhead incurred	12,320	44,385	18,180	16,720
Actual direct labour-hours worked	30,800	80,700	40,400	30,400
Overhead absorption rate				
per direct labour hour	0.50	0.45	0.40	0.50
Total overhead absorbed	15,400	36,315	16,160	15,200
Direct labour-hours contained in:				
Work-in-progress	3,000	10,400	1,900	7,200
Finished goods	4,300	8,300	4,000	2,900

You are required to:

- calculate for each department the direct labour-hour rates of overhead incurred.
- calculate the extent to which the value of work-in-progress and finished goods be increased or decreased for each department for the year in view of corrected rates.
- what will be the impact on total profit of the company in view of the correction in above?

Ans:

(a)	Departments			
	(1)	(2)	(3)	(4)
Direct labour hour rate Re.	0.40	0.55	0.45	0.55

(c) Impact on profit (Increase) Rs. 1,940

22. A manufacturing unit has predetermined the overhead recovery rates as 400% on direct wages, 20% on works cost and 25% on cost of production for works expenses, management expenses and commercial expenses respectively. At the end of the year, it has been found that the works overhead stand under-absorbed to the extent of 30% of the total productive wages, management overheads show under-recovery of one-eighth of the absorbed amount, the recovery of commercial expenses results in an over-absorption of one-third of the total amount absorbed. If the prime costs of the three jobs are as under, find the profit/loss on the respective selling prices (both on the basis of standard cost and on the basis of full absorption overheads).

	Job A	Job B	Job C
Direct materials	Rs. 45.50	Rs. 32.60	Rs. 26.80
Direct wages	15.20	8.60	7.20
	<u>Rs. 60.70</u>	<u>Rs. 41.20</u>	<u>Rs. 34.00</u>
Selling price	Rs. 200.00	Rs. 130.00	Rs. 90.00

(ICWA, Inter)

Ans:

	Job A	Job B	Job C
Profit (loss) at standard cost	Rs. 17.75	16.60	(4.20)
Profit (loss) at full absorption	Rs. 22.30	19.69	(1.65)

23. The Pipe Company manufactures two products, A and B during the first year of its operations. For the purpose of product costing, an overhead rate of application of Rs. 1.70 per direct-labour was used, based on budgeted factory overhead of Rs. 3,40,000 and budgeted direct-labour hours of 2,00,000 as follows:

	Budgeted overhead	Budgeted hours
Department 1	Rs. 2,40,000	1,00,000
Department 2	1,00,000	1,00,000
Total	<u>Rs. 3,40,000</u>	<u>Rs. 2,00,000</u>

The number of labour-hours required to manufacture each of these products was:

	Product A	Product B
Department 1	4	1
Department 2	1	4
	<u>5</u>	<u>5</u>

At the end of the year, there was no work in process. There were, however, 2,000 and 6,000 finished units, respectively, of products A and B on hand. Assume that budgeted activity was attained.

- (a) What was the effect on the company's income of using a plant-wise overhead rate instead of departmental overhead rates?
- (b) Assume that material and labour costs per unit of Product-A were Rs. 10 and that the selling price was established by adding 40 per cent to cover profit and selling and administrative expenses. What difference in selling price would result from the use of departmental against plant-wise overhead rates? *(ICWA, Inter)*

Ans: (a) Overstatement of company's income by Rs. 8,400
(b) Difference in selling price Rs. 2.94

24. 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)*

Ans: Deptt A Rs. 1,700 (over-absorbed)
Deptt B Rs. 300 (under-absorbed)
Deptt C Rs. 800 (over-absorbed)
Deptt D Rs. 100 (under absorbed)

ADMINISTRATIVE AND SELLING AND DISTRIBUTION OVERHEADS

Learning Objectives:

After reading this chapter, you should be able to:

1. describe administrative overheads—meaning, items and distribution;
2. describe selling and distribution overheads—meaning, items and apportionment; and
3. explain the treatment of some items of expenses such as interest on capital, depreciation.

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, that is, 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	II	III	IV
			East zone	West zone	North zone	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</i>		
	<i>I</i>	<i>II</i>	<i>III</i>
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	16,000	6,000	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

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

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

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

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

<i>Territory</i>	<i>I</i>	<i>II</i>	<i>III</i>
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 2008 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	<i>A</i>	15,000	
	<i>B</i>	25,200	
	<i>C</i>	9,800	
	<i>D</i>	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
<i>A</i>	36	5	6,000	30%	6
<i>B</i>	48	6	14,000	30%	8
<i>C</i>	16	2	4,500	20%	4
<i>D</i>	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			
			<i>A</i> Rs.	<i>B</i> Rs.	<i>C</i> Rs.	<i>D</i> 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
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 =		10.62%	10.48%	10.40%	10.74%	11.30%
$\frac{\text{Overhead}}{\text{Sales}} \times 100$						

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	B	C
	Rs.	Rs.	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)	3,480
Ordering and billing	2,450
Packing	3,600
Storage	5,060
	<u>30,590</u>

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				

(Contd.)

Particulars	Basis of apportionment	Total Rs.	A Rs.	B Rs.	C Rs.
	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 × 1 × 4000 = 40,000
B	20 × 2 × 2000 = 80,000
C	12 × 1/2 × 2000 = 12,000, that is, 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	<u>24,000</u>	<u>18,000</u>	<u>18,000</u>	<u>60,000</u>
B. Manufacturing Cost:				
Fixed	4,000	1,000	4,000	9,000
Variable	<u>4,000</u>	<u>5,000</u>	<u>2,000</u>	<u>11,000</u>
Total: B	<u>8,000</u>	<u>6,000</u>	<u>6,000</u>	<u>20,000</u>
C. Gross profit (A-B)	16,000	12,000	12,000	40,000
D. Less: Selling & Distribution cost	<u>11,611</u>	<u>11,151</u>	<u>7,828</u>	<u>30,590</u>
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 2007.

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	<u>35,500</u>
	<u>Rs. 1,30,000</u>
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 <i>A</i>	80,000
<i>B</i>	1,20,000
<i>C</i>	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		
			<i>A</i>	<i>B</i>	<i>C</i>
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
Net Profit	1,30,000	20,500	33,000	36,500	40,000
	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 stopping 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

(Contd.)

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

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 forwarding one unit is the same for both the products. Salesmen 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:

- (i) Set up a schedule showing the apportionment of the indirect selling and distribution costs between the two products.
- (ii) 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
		28,88,000	14,55,000	14,33,000

(ii) Statement Showing the Relative Profitability of the Products

Products	A Rs.	B Rs.
Annual Sales Value	50,00,000	80,00,000
	(10,000 units × Rs. 500)	(8,000 units × Rs. 1,000)
Less: Cost of Sales	30,00,000	48,00,000
	(10,000 units × Rs. 300)	(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	5,45,000	17,67,000
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 in 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, both equity capital and borrowed capital.
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 businessman 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, productions 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 usually 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 for 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.

2. The cost of drawings for specific products or jobs is charged directly to the specific products or jobs.
3. 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 is 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 7.7

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) 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.
- (b) An abnormal gain of Rs. 42,500 was noticed in process A of a chemical factory at the end of a month.
- (c) A sum of Rs. 15,000 was realised by sale of saw dust and useless scantlings in a furniture-making business.
- (d) In a factory, using historical cost system, there was a under-recovery of fixed factory overheads amounting to Rs. 24,000 at the end of the accounting period.
- (e) A company spent Rs. 15 lakhs on advertisement in the national television network before launching a new product.
- (f) A sum of Rs. 20,000 was incurred on printing and stationery in connection with the issue of non-convertible debentures by a company.
- (g) A sum of Rs. 7,500 was paid as wages to workers in a factory when there was no work due to power failure.
- (h) 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:

- (a) 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 stores ledger.
- (b) 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.
(B.Com. (Hons), Delhi, 2007)
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 for and against inclusion of interest on capital in cost accounts.
(B.Com. (Hons), Delhi, 2006)
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 Year)
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 company is producing three types of products, A, B, C. The sales territory of the company is divided into three areas, X, Y and Z. The estimated sales for the year are as under:

Product	Territories		
	X (Rs.)	Y (Rs.)	Z (Rs.)
A	50,000	20,000	—
B	30,000	—	80,000
C	—	70,000	40,000

Budgeted advertising cost is as under:

	Territories			Total
	X	Y	Z	Rs.
Local cost	3,200	4,500	4,200	11,900
General	—	—	—	5,800

You are required to find the advertising cost per cent on sales for each product and the territory showing how you will present the statement to management.

(ICWA, Inter)

Ans:

	Products		
	A	B	C
Advertising as a percentage of sales	6.28%	5.64%	6.45%

2. Domestic Ltd. makes three basic types of household products. Their production statistics for the past year is given as follows:

	Product-1	Product-2	Product-3
No. of units manufactured	1,20,000	80,000	60,000
Direct material cost (Rs.)	2,76,000	1,38,000	2,64,000
Direct labour cost (Rs.)	96,000	56,000	60,000
Manufacturing overhead (Rs.)	48,000	28,000	30,000
Total cost (Rs.)	4,20,000	2,20,000	3,54,000

The selling and the administration cost for the year were as follows:

	Rs.
Sales salaries	52,000
Sales commission	1,42,700
Advertising	28,400

(Contd.)

Travel and entertainment	15,200
Delivery expenses	8,000
Sales office expenses	21,000
Office salaries	18,500
Office supplies used	3,200
Administration office expenses	6,100
	2,95,100

Products 1 and 2 were sold at 40% above manufactured cost, while product-3 was sold at 50% above its manufactured cost.

Domestic Ltd. has devoted a great deal of time and effort in developing sales of product-3. The management is now questioning the wisdom of this policy and has authorised a study of selling and administrative cost by product lines.

An analysis reveals the following:

Cost	Basis of allocation	Product lines		
		1	2	3
Sales salaries, travel and entertainment	Percentage of time devoted to each line	20	30	60
Advertising	Percentage basis	30	20	50
Sales commission	10% of net sales	—	—	—
Sales office expenses	No. of orders	150	30	120
Office salaries	No. of orders			
Office supplies used	No. of orders			
Administrative office expenses	No. of orders			
Delivery expenses	Weight-distance ratios	30	30	40

All products for the year was sold, with no inventory costs carried forward from the beginning of the year and no returns of sales by customers.

Required:

- (i) Prepare a profit statement with all costs broken down according to product line.
- (ii) Indicate which product line shows the higher rate of profit to sales and which the least.

(ICWA, Final)

Ans:

	Products		
	1	2	3
Profit (Rs)	60,440	30,800	46,660
Profit to sales ratio	10.28%	10%	8.79%

3. A match factory sells its goods in four district zones—South, North, East and West. You have been given the particulars for January 2008 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%

322 Cost Accounting

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	<u>3,600</u>	26,400
Insurance on inventories at out-stations		12,200
Commission on sales @ 2 1/4%		62,500
Transportation charges outward		<u>36,000</u>
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%.

ACTIVITY-BASED COSTING (ABC)

Learning Objectives:

After reading this chapter, you should be able to:

1. explain Activity-Based Costing (ABC) — definition, its stages and flow of costs, its advantages and disadvantages and its utility in service organisations;
2. discuss the classification of activities in manufacturing organisations for ABC;
3. discuss the concepts of cost driver, target costing, Kaizen costing, Life cycle costing, Activity-based management (ABM) and the differences between traditional costing system and activity-based costing system.

MEANING OF ACTIVITY-BASED COSTING (ABC)

Activity-based Costing (ABC) is that costing in which costs are first traced to activities and then to products. The ABC is a costing system which focuses on activities performed to produce products. Activities become the focal points for cost accumulation. This costing system assumes that activities are responsible for the incurrence of costs and products create the demands for activities. Costs are charged to products based on individual product's use of each activity. In traditional product costing system, costs are, first, traced not to activities but to an organisational unit, such as department or plant and then to products. It means under both ABC and traditional costing system, the second and final stage consists of tracing costs to the product. By emphasising activities, ABC tries to ascertain the factors that cause each major activity, cost of such activities and the relationship between activities and products produced. The relationship between activities and products has been shown in the Figure 8.1.

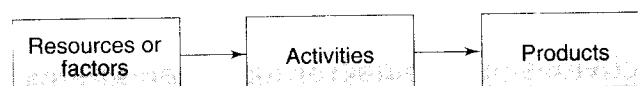


Fig. 8.1 ABC Process

STAGES AND FLOW OF COSTS IN ABC

There are two primary stages in ABC—first, tracing costs to activities; second, tracing activities to products. The different steps in the two stages of ABC are explained below:

- Step 1 Identify the main activities in the organisation.
Examples include: materials handling, purchasing, receipt, despatch, machining, assembly and so on.
- Step 2 Identify the factors which determine the costs of an activity. These are known as *cost drivers*.
Examples include: number of purchase orders, number of orders delivered, number of setups and so on.
- Step 3 Collect the costs of each activity. These are known as cost pools and are directly equivalent to conventional cost centres.
- Step 4 Charge support overheads to products on the basis of their usage of the activity, expressed in terms of the chosen cost driver(s). For example, if the total costs of purchasing were Rs. 2,00,000 and there were 1,000 Purchase orders (the chosen cost driver), products would be charged Rs. 200 per purchase order. Thus a batch generating 3 purchase orders would be charged $3 \times \text{Rs. } 200 = \text{Rs. } 600$ for Purchasing overheads.

COST DRIVERS

A cost driver is an activity which generates cost. A cost driver is a factor, such as the level of activity or volume, that casually affects costs (over a given time span). That is, a cause-and-effect relationship exists between a change in the level of activity or volume and a change in the level of the total costs of that cost object. Thus, cost drivers signify factors, forces or events that determine the costs of activities. Thus, the factors (costdrivers) that influence the cost of a particular activity should be identified. It should be understood that direct costs do not need cost drivers as they can be traced directly to a product. Direct costs are themselves cost drivers. However, all other factory or manufacturing costs need cost drivers. Cost drivers are the links and they can link a pool of costs in an activity centre to the product. Therefore, in order to trace overhead costs to products, appropriate cost drivers should be identified. Figure 8.2 gives examples of some cost drivers in activity based costing system.

In traditional product costing, the number of cost drivers used are few such as direct labour hours, machine hours, direct labour cost, units produced. But ABC may use a multitude of cost drivers that relate costs more closely to the resources consumed and activities occurring.

Costs that are fixed in the short run have no cost drivers in the short run but may have cost drivers in the long run. For instance, costs of testing personal computers (which comprise costs of testing department equipment and staff costs) may not change with changes in the volume of production. Therefore, these costs would be fixed in the short run. In the long run, however, an organisation may need to increase/decrease testing department's equipment and staff to the levels needed to support future production volumes. So, in the long-run, volume of production or activity becomes cost drivers of these testing and staff costs.

Classification of Activities in Manufacturing Organisations

In manufacturing organisations, activities are identified and classified into different categories or segments of the production process. The grouping of activities is preferably done using the different levels at which activities are performed. Broadly, activities are classified into one of four activity categories:

1. Unit level Activities.
2. Batch level Activities.

Cost Drivers

1. Number of receiving orders for the receiving department.
2. Number of purchase orders for the cost of operating the purchase department.
3. Number of despatch orders for the despatch department.
4. Number of units.
5. Number of setups.
6. Amount of labour cost incurred.
7. Value of materials in a product.
8. Number of materials handling hours.
9. Number of inspections.
10. Number of schedule changes.
11. Number of parts received per month.
12. Number of machine hours used on a product.
13. Number of set up hours.
14. Number of direct labour hours.
15. Number of sub-assemblies.
16. Number of vendors.
17. Number of purchasing and ordering hours.
18. Number of units scrapped.
19. Number of labour transactions.
20. Number of parts.
21. Number of customer orders processed.
22. Number of employees.

Fig. 8.2 Cost Drivers

3. Product level Activities.
4. Facility-level Activities.

Unit level activities are those activities which are performed each time a unit is produced. They are repetitive activities. For example, direct labour hours, machine hours, power are used each time a unit is produced. Direct materials and direct labour activities are also unit level activities, although they are not overhead costs. Costs of unit level activities vary with the number of units produced.

Batch level activities are those activities which are performed each time a batch of goods or products is produced. The costs of batch level activities vary with the number of batches but are fixed with respect to the number of units in each batch. Machine setups, inspections, production scheduling, materials handling are examples of batch level activities which are related to batches but not to individual products.

Product level activities are those activities which are performed to support the production of each different type of product. Maintenance of equipment, engineering charges, testing routines, maintaining bills of materials, handling materials are some examples of batch-level activities.

Facility-level activities are those which are needed to sustain a factory's general manufacturing process. These activities are common to a variety of products and are most difficult to link to product specific activities. Examples of facility level activities are factory management, maintenance, security, plant depreciation.

In ABC system, facility level activities and costs are treated as period cost as they are found difficult to assign to different products. The costs associated with the first three categories—unit level, batch level, product level—are assigned to products, using cost drivers that reflect the cause and effect relationship between activity consumption and cost.

Several additional examples of the costs driven by activities at each above level are presented in Fig. 8.3.

<i>Activity Level</i>	<i>Reason for Activity</i>	<i>Examples of Activity Cost</i>
1. Unit level	Performed for each unit of product produced or sold	<ul style="list-style-type: none"> • Cost of raw materials • Cost of inserting a component • Utilities cost of operating equipment • Some costs of packaging • Sales commissions
2. Batch level	Performed for each batch of product produced or sold	<ul style="list-style-type: none"> • Cost of processing sales order • Cost of issuing and tracking work order • Cost of equipment setup • Cost of moving batch between workstations • Cost of inspection (assuming same number of units inspected in each batch)
3. Product level	Performed to support each different product that can be produced	<ul style="list-style-type: none"> • Cost of product development • Cost of product marketing such as advertising • Cost of specialised equipment • Cost of maintaining specialised equipment
4. Facility level	Performed to maintain general manufacturing capabilities	<ul style="list-style-type: none"> • Cost of maintaining general facilities such as buildings and grounds • Cost of nonspecialised equipment • Cost of maintaining nonspecialised equipment • Cost of real property taxes • Cost of general advertising • Cost of general administration such as the plant manager's salary

Fig. 8.3 Activity Levels and Associated Activity costs

Source: Wayne J. Morse, James R. Davis, Al. L. Hartgraves, Management accounting, A Strategic Approach, South Western College Publishing, 2000, p.54.

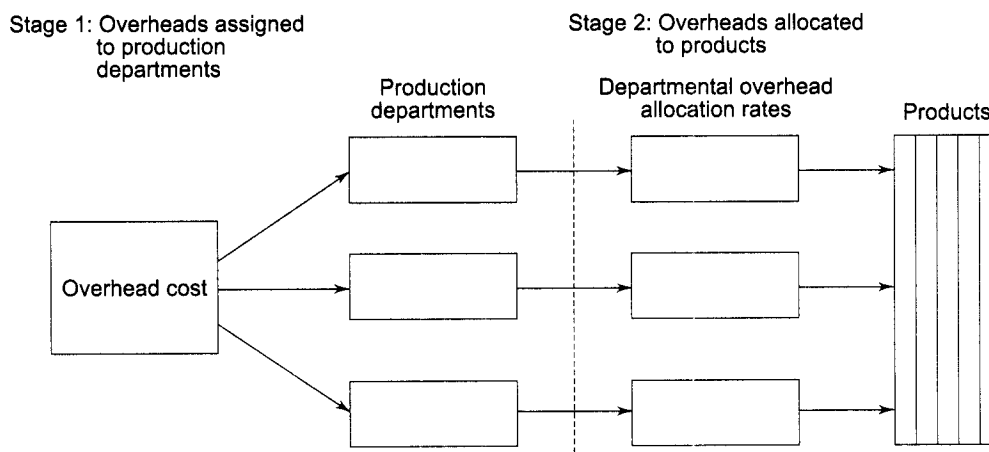
Comparing ABC with Traditional Costing System

In traditional costing system, overhead costs are assumed to be influenced by only units produced. It means, in traditional costing system, costs of batch level, product level and facility level activities are fixed costs, that is, costs of these do not vary as production volume changes. Unit-based cost systems apportion fixed overhead to individual products and variable overhead are directly assigned to products using the base of number of units produced.

When fixed overheads are apportioned on the basis of units made, as in traditional costing, such apportionment is likely to be arbitrary and also may not reflect activities and cost actually consumed by the products. ABC improves product costing procedure (as compared to traditional costing) because it recognises that many so-called fixed overhead costs vary in proportional to changes other than production units. It means, under ABC, the other two level activities—batch level and product level—are assumed to influence fixed overhead costs and batch level and product level, thus, are accepted as non unit-based cost drivers. By establishing the link between these cost drivers and fixed overhead costs, they are finally traced to individual products. Figure 8.4 presents an overview of product cost determination under traditional costing and ABC system.

Traditional Costing and Activity-Based Costing System

(a) Traditional product costing system



(b) Activity-based product costing system

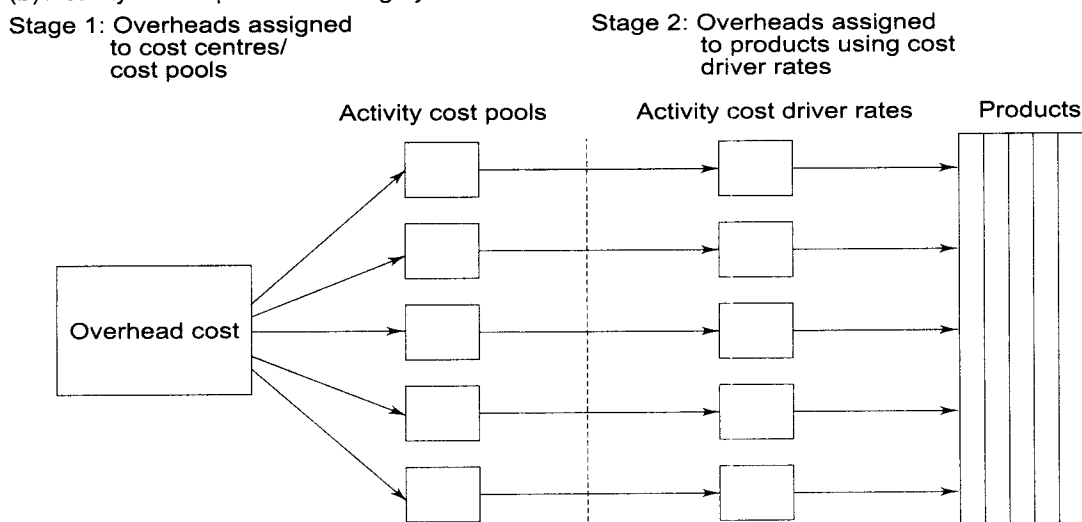


Fig. 8.4 Comparison of Traditional and Activity-Based Costing System

Source: J. Innes and F. Mitchell, *Activity-Based Costing: A Review with Case Studies*, 1990, CIMA, U.K.

Figure 8.4 displays that both the costing systems follow a two stage allocation procedure. In traditional costing, in the first stage, overhead costs are allocated to production departments. But in ABC, in the first stage, overhead costs are assigned to each major activity and not to departments. In traditional costing, overheads are pooled/collected department-wise. But, in ABC, many activity-based cost pools or cost centres

are created. In traditional costing, overhead costs of service departments are allocated/reapportioned to production department and therefore in this costing system finally only fewer cost pools exist. But ABC creates separate cost pools for service activities as well and overhead costs of these service activities (service departments) are assigned directly to specific products through applying cost driver rates. Thus, in ABC, there is no need to allocate/reapportion overheads of service departments.

The fundamental differences in the conventional and ABC cost system are summarised in Fig. 8.5.

	<i>Traditional</i>	<i>ABC</i>
• Cost pools	• One or a limited number	• Many, to reflect different activities
• Applied rate	• Volume-based, financial	• Activity-based, nonfinancial
• Suited for	• Labour-intensive, Low-overhead companies	• Capital-intensive, product-diverse, high-overhead companies
• Benefits	• Simple, inexpensive	• Accurate product costing, possible elimination of non-value-added activities

Fig. 8.5 Traditional and ABC System

Advantages of ABC

The following are the advantages of ABC.

1. ABC brings accuracy and reliability in product cost determination by focussing on cause and effect relationship in the cost incurrence. It recognises that it is activities which cause costs, not products and it is product which consume activities.
2. In advanced manufacturing environment and technology where support functions overheads constitute a large share of total costs, ABC provides more realistic product costs.
3. ABC identifies the real nature of cost behaviour and helps in reducing costs and identifying activities which do not add value to the product. With ABC, managers are able to control many fixed overhead costs by exercising more control over the activities which have caused these fixed overhead costs. This is possible since behaviour of many fixed overhead costs in relation to activities now become more visible and clear.
4. ABC uses multiple cost drivers, many of which are transaction based rather than product volume. Further, ABC is concerned with all activities within and beyond the factory to trace more overheads to the products.
5. ABC traces costs to areas of managerial responsibility, processes, customers, departments besides the product costs.
6. ABC improves greatly the manager's decision making as they can use more reliable product cost data. ABC helps usefully in fixing selling prices of products as more correct data of product cost is now readily available.
7. ABC produces reliable and correct product cost data in case of greater diversity among the products manufactured such as low-volume products, high-volume products. Traditional costing system is likely to bring errors and approximation in product cost determination due to using arbitrary apportionment and absorption methods.
8. ABC provides cost driver rates and information on transaction volumes which are very useful to management for cost management and performance appraisal of responsibility centres. Cost driver rates can be used advantageously for the design of new products or existing products as they indicate overhead costs that are likely to be applied in costing the product.

Colin Drury¹ observes:

“ABC provides not only a base for calculating more accurate product costs but also a mechanism for managing costs. An ABC system focuses management attention on the underlying causes of costs. It assumes that resource-consuming activities cause costs and that products incur costs through the activities they require for designing, engineering, manufacturing, marketing, delivery, invoicing and servicing. By collecting and reporting on the significant activities in which a business engages, it is possible to understand and manage costs more effectively.

With an ABC system, costs are managed in the long run by controlling the activities that drive them. In other words, the aim is to manage the activities rather than costs. By managing the forces that cause the activities (that is, cost drivers), costs will be managed in the long-term. The application of activity-based systems may have the greatest potential for contributing to cost management, budgeting, control and performance evaluation.”

Demerits of ABC

The following are the demerits of ABC.

1. ABC has numerous cost pools and multiple cost drivers and therefore can be more complex than traditional product costing systems.
2. Some difficulties emerge in the implementation of ABC system, such as selection of cost drivers, assignment of common costs, varying cost driver rates etc.
3. ABC has different levels of utility for different organisation such as large manufacturing firm can use it more usefully than the smaller firms. Also, it is likely that firms depending on cost-plus pricing can take advantages from ABC as it gives accurate product cost. But those firms who use market based prices may not favour ABC. The level of technology and manufacturing environment prevailing in different firms also affect the application of ABC.
4. It can prove costly to manage ABC system.

The decision to use ABC is comparing costs and benefits relating to this system. The advantages to a company of ABC system depends on many factors such as level of competition, number of products manufactured and product diversity. It can be claimed that those companies who operate in a more competitive environment, are in dire need of correct product cost data for taking sound decisions with regard to determination of selling prices and taking better cost management measures. Whether a company manufactures and sells smaller number or large number of products, it influences the operation of ABC system and the degree of sophistication in the system.

ABC in Service Organisations

The discussion of ABC so far has focussed on manufacturing companies where important cost components like direct material and direct labour can be traced to individual products. Therefore indirect costs are likely to be a much smaller proportional of total costs in such manufacturing companies. In service organisations, most of the costs are treated fixed and indirect, and therefore irrelevant for most decisions. No attempt is made to make profitability analysis in service organisations. There is a greater need of using ABC in service companies. Kaplan and Cooper² suggest that service companies are ideal candidates for ABC, even more than manufacturing companies. Earlier, service organisations were government-owned or operated in highly

1. Colin Drury, *Management and Cost Accounting*, Thomas Learning, 2000, p. 285.

2. R.S. Kaplan and R. Cooper, *Cost and Effect: Using Integrated Systems to Drive Profitability and Performance*, Harvard Business School, Press, 1998.

regulated, protected and non-competitive environment. Thus, service organisations were not under any pressure to improve profitability by eliminating non-value added or non-profit activities. The prices of services were simply increased to cover cost increases. No efforts was made to design a cost system that accurately measures the costs and profitability of individual services.

However, due to privatisation, deregulation and increasing competition, the service organisations need to have cost and management accounting systems which can help them to accurately measure cost and resulting profitability for their services, customers and markets. Therefore, ABC would prove advantageous to service organisations to understand their cost base and to make decisions on value-added/non-value added activities.

TARGET COSTING

Target costing implies developing product cost in terms of what the market will pay for a product with specific characteristics.

Target costing is a systematic approach to establishing product cost goals based on market driven standards. It is a strategic management process for reducing costs at the early stages of product planning and design. Target costing begins with identifying customer needs and calculating an acceptable target sales price for the product. Working backward from the sales price, companies establish an acceptable target profit and calculate the target cost as follows:

$$\text{Target Cost} = \text{Target Price} - \text{Target Profit}$$

Target Costing is different from standard costing. While target costs are determined by market driven standards (target sales price—target profit = target cost), standard costs are determined by design—driven standards with less emphasis on what the market will pay (engineered costs + desired markup = desired sales price).

Since the early 1970s target costing has been used by some companies, especially Japanese companies which aim to ascertain cost in a different manner. Target costing is a common practice where markets are extremely competitive. The market determines the price of products and there is a little opportunity for the individual organisations to set prices. Therefore, controlling cost is extremely important.

KAIZEN COSTING

Kaizen Costing, also referred as continuous improvement costing, is a mechanism for reducing and managing costs. Kaizen is the Japanese term for making continuous improvements in relatively small activities rather than major innovative improvement. The major difference between target and Kaizen costing is that target costing is applied during the design stage whereas Kaizen costing is applied during the manufacturing stage of the product life cycle.

The objective of Kaizen costing is to reduce actual costs to manufacture a product below the standard cost. Standard cost system generally aim to achieve the cost standards set by management while Kaizen costing systems are more concerned with reducing actual costs below standard costs. The potential cost reductions are smaller with Kaizen costing because the products are already in the manufacturing stage of their life cycles and a significant proportional of costs will have become locked-in.

Barfield, Raiborn and Kinney³ have stated the following differences between target costing and Kaizen costing.

3. Jesset T. Barfield, Cecily A. Raiborn and Michael R. Kinney, *Cost Accounting, Traditions and Innovations*, 5th Ed: Thomson, 2003, p.721.

	<i>Target Costing</i>	<i>Kaizen Costing</i>
What?	A procedural approach to determining a maximum allowable cost for an identifiable, proposed product assuming a given target profit margin	A mandate to reduce costs, increase product quality, and/or improve production processes through continuous improvement efforts
Used for?	New products	Existing products
When?	Development stage (includes design)	Primary production stages (introduction and growth; possibly, but not probably, maturity)
How?	Works best through aiming at a specified cost reduction objective; used to get original production standards	Works best through aiming at a specified cost reduction objective; reductions are integrated into original production standards to sustain improvements and provide new challenges
Why?	Extremely large potential for cost reduction because 80% to 90% of a product's lifelong costs are embedded in the product during the design and development stages	Limited potential for reducing cost of existing products, but may provide useful information for future target costing efforts
Focus?	All product inputs (material, labour, and overhead elements) as well as production processes and supplier components	Depends on where efforts will be most effective in reducing production costs; generally begins with the most costly component and (in the more mature companies) ends with overhead components

LIFE-CYCLE COSTING

Life-Cycle Costs are all the costs associated with the product for its entire life cycle. They include development (planning, design and testing), production (conversion activities), and logistics support (advertising, distribution, warranty and so on). Identifying costs during the different phases of a product's life cycle helps to develop understanding of costs and subsequently in managing the costs incurred throughout its life cycle. Life-cycle costs provide important information for pricing.

ACTIVITY-BASED MANAGEMENT (ABM)

As stated earlier in this chapter, Activity-Based Costing (ABC) is concerned with ascertainment of costs. In ABC, resources are assigned to activities based upon consumption and activities are assigned to cost objects (products, jobs, services) based on consumption. ABC assumes and gives due importance to causal relationship of cost drivers to activities.

Activity-based management (ABM) emphasises on management of activities with the objectives of improving the value received by the customer and the profit achieved by business enterprise by providing this value. It includes cost driver analysis, activity analysis and performance measurement and depends on ABC for its major source of data. Holst and Savage⁴ observe:

“ABC is used to answer the question what do things cost? while ABM, employing a process view, is concerned with what factors cause costs to occur. Using ABC data, ABM focuses on how to redirect and improve the use of resources to increase the value created for customers and other stakeholders”.

4. Randolph Holst and Robert J. Savage, Tools and Techniques for Implementing Activity-Based Management” in Steve Player et al (Eds.) Arthur Anderson's Global Lessons on Activity-Based Management, John Wiley and Sons, New York, 1999, p 4.

Through focusing on activity analysis, cost driver analysis and activity-based costing, ABM helps companies to produce more efficiently, determine costs more accurately and control and evaluate performance more effectively. ABM through activity analysis analyses activities, classifies them into value-added and non-value added activities and finally develops means and methods of minimising or eliminating non-value added activities.

Example 8.1

ABC manufacturing Co. has been using a cost system that allocates all factory overhead costs to products based on 350 per cent of direct labour cost. The company has just decided to use Activity-Based Cost System (ABC) that traces indirect costs to products based on consumption of major activities as indicated below.

Activity	Annual cost driver quantity	Cost (Rs.)	Product' cost Driver consumption
Labour	Rs. 3,00,000	30,000	Rs. 10,000
Machining	20,000 hours	5,00,000	800 hours
Setup	10,000 hours	1,00,000	100 hours
Production order	2000 orders	2,00,000	12 orders
Material handling	1000 requisitions	20,000	5 requisitions
Parts administration	12,000 parts	4,80,000	18 parts

Required:

Compare the total annual costs of the product using both the traditional volume-based and new ABC system.

Solution:

Cost system	Pool rate	Cost driver Consumption	Cost Assignment (Rs.)
Traditional cost system	350%	Rs. 10,000	Rs. 35,000
ABC System:			
(i) Labour	10%	Rs. 10,000	Rs. 1,000
(ii) Machining	Rs. 25 per hour	800 hours	20,000
(iii) Set up	Rs. 10 per hour	100 hours	1,000
(iv) Production order	Rs. 100 per order	12 orders	1200
(v) Material handling	Rs. 20 per requisition	5 requisitions	100
(vi) Parts administration	Rs. 40 per part	18 parts	720
			Rs. 24,020

Conclusion: The total cost of product under ABC is Rs. 24,020 whereas under traditional cost system it is Rs. 35,000.

Example 8.2

ABC manufacturing company has three accounts clerks responsible for processing purchase invoices. Each clerk is paid a salary of Rs. 3,00,000 p.a. and is capable of processing 5000 invoices per year (working efficiently). In addition to the salary, the company spends Rs. 90,000 per year for forms, postage etc. (assuming that 15,000 invoices are processed). During the year, 12,500 invoices were processed.

Required:

1. Calculate the activity rate for the purchase order activity. Break the activity into fixed and variable components.
2. Compute the total activity availability and break this into activity usage and unused activity.
3. Calculate the total cost of resources supplied and break this into activity usage and unused activity.

Solution:

1. Activity Rate = $[(3 \times \text{Rs. } 3,00,000) + \text{Rs. } 90,000]/15,000$
 = Rs. 66 per invoice
 Fixed activity rate = $\text{Rs. } 9,00,000/15,000$
 = Rs. 60 per invoice
 Variable activity rate = $\text{Rs. } 90,000/15,000$
 = Rs. 6 per invoice
2. Activity availability = Activity usage + Unused activity
 15000 invoices = 12,500 invoices + 2500 invoices
3. Cost of resources supplied = Cost of activity used + Cost of unused activity
 $\text{Rs. } 9,00,000 + (\text{Rs. } 6 \times 12,500) = (\text{Rs. } 66 \times 12,500) + (\text{Rs. } 60 \times 2500)$
 $\text{Rs. } 9,75,000 = \text{Rs. } 8,25,000 + 1,50,000$

Example 8.3

A company manufacturing two products furnishes the following data for a year:

Product	Annual output (units)	Total machine hours	Total number of purchase orders	Total number of set-ups
A	5,000	20,000	160	20
B	60,000	1,20,000	384	44

The annual overheads are as under:

	Rs.
Volume related activity costs:	5,50,000
Set-up related costs	8,20,000
Purchase related costs	6,18,000

You are required to calculate the cost per unit of each product A and B based on:

- (a) Traditional method of charging overheads.
- (b) Activity based costing method (*B.Com.(Hons), Delhi, 2006, CA, PE, Exam II, Group II, Nov. 2002*)

Solution:

(a) Traditional method of charging overheads:	Rs.
Volume related activity costs	5,50,000
Set-up related costs	8,20,000
Purchase related costs	6,18,000
Total costs	Rs. 19,88,000
Total machine hours (20,000 + 1,20,000)	= 1,40,000
Total cost per hour (Rs. 19,88,000/1,40,000)	= Rs. 14.20
Cost per unit of A = (20,000 × Rs. 14.20)/5,000	= Rs. 56.80
Cost per unit of B = (1,20,000 × Rs. 14.20)/60,000	= Rs. 28.40

(b) Activity based costing method of charging overheads:

Volume related activity cost per machine hour: Rs. 5,50,000/1,40,000	= Rs. 3.9286
Set-up costs per set-up: Rs. 8,20,000/64	= Rs.12,812.50
Purchase related costs per purchase order: Rs. 6,18,000/544	= Rs. 1136.029

Cost per unit of product

Particulars	Cost driver	A	B
Volume related costs	Machine hours	Rs. 78,572	Rs. 4,71,432
Set-up costs	Number of set-ups	2,56,240	5,63,728
Purchase related costs	Number of purchase orders	1,81,765	4,36,235
	Total costs	Rs. 5,16,577	Rs. 14,71,395
Cost per unit		Rs. 103.32	Rs. 24.52

Example 8.4

S. Chand and Co., a leading publisher, publishes two versions of a text book. One is paperback and the other is hard bound. Management is considering publishing only the higher quality book. The firm assigns its Rs. 500,000 of overhead to the two types of books. The overhead is composed of Rs. 2,00,000 of utilities and Rs. 3,00,000 of quality control inspectors's salaries. Some additional data follow:

	Paperback	Hard Bound
Revenues	Rs. 16,00,000	Rs. 14,00,000
Direct costs	Rs. 12,50,000	Rs. 6,00,000
Production (units)	5,00,000	3,50,000
Machine hours	42,500	7,500
Inspections	2,500	12,500

Required:

- Compute the overhead cost that should be allocated to each type of text book using cost drivers appropriate for each type of overhead cost.
- The firm has used machine hours to allocate overhead in the past. Should the publisher stop producing the paperback books? Explain why management was considering this action and what its decision should be.

Solution: (a)

	Paperback	Hard Bound	Total
Machine hours	42,500	7,500	50,000
Rate per MH (Rs. 2,00,000 ÷ 50,000)	× Rs. 4	× Rs. 4	× Rs. 4
Utility cost	Rs. 1,70,000	Rs. 30,000	Rs. 2,00,000
Number of inspections	2,500	12,500	15,000
Rate per inspection (Rs. 30,00,000 ÷ 15,000)	× Rs. 20	× Rs. 20	× Rs. 20
Quality inspection cost	Rs. 50,000	Rs. 2,50,000	Rs. 3,00,000
Total traceable overhead costs	Rs. 2,20,000	Rs. 2,80,000	Rs. 5,00,000

- Income calculation using machine hours to allocate utilities and inspection hours to allocate inspectors' salaries to products:
Using the traditional cost driver (machine hours), the following results had been achieved, given a Rs. 10 charge (Rs. 5,00,000 ÷ 50,000) per MH: