Cost Allocation (overhead)

- Direct cost : The cost which can be directly traced out to it is particular's product is known as direct cost .
- Indirect cost : The cost which cannot be directly traced out to it is particular's product is known as indirect cost.

Methods of distribution of indirect cost

1. Traditional method: Department wise = Distribution of indirect cost
   - A Primary Distribution of Overhead
   - B Secondary Distribution of Overhead
     - i. Direct Allocation Method
     - ii. Step Allocation Method
     - iii. Reciprocal Method
       - a. Simultaneous Equation Method
       - b. Repeated Distribution Method
       - c. Trial and Error Method
2. Activity based costing system : product wise = distribution of indirect cost
   1. Traditional method
      - A. Primary Distribution of Overhead

Details	Base	Total	Department			
			Production		Service	
			P1	P2	S1	S2
Direct materials	Given	×××	-	-	×××	×××
Direct wages	Given	×××	-	-	×××	×××
indirect materials	Direct material	×××	×××	×××	×××	×××
indirect wages	Direct wages	×××	×××	×××	×××	×××
Rent	Area	×××	×××	×××	×××	×××
Repairs	Value of plant	×××	×××	×××	×××	×××
Depreciation	Value of plant	×××	×××	×××	×××	×××
Light expenses	Area [sq. ft.]	×××	×××	×××	×××	×××
Supervision	No. of employee	×××	×××	×××	×××	×××
Insurance of stock	Value of stock	×××	×××	×××	×××	×××
Group insurance	No. of employees	×××	×××	×××	×××	×××
Power	HP of machine	×××	×××	×××	×××	×××
Primary Distribution		×××	×××	×××	×××	×××

Items of Overhead	Basis
Rent, rates and taxes, depreciation on building, heating & lighting, air condition, fire precaution service, etc.	Area/Space occupied
Welfare, canteen expenses, personnel office, supervision, time and wage office expenses, etc.	No. of employees
Depreciation, repairs & maintenance, insurance on assets	Assets Value
Lighting expenses	No. of light points
Indirect materials, stores overhead	Direct materials
Indirect wages, office overhead, employee compensation, provident fund, etc.	Direct wages
Power/Electricity	Horsepower/KWH

General overhead, sundries, miscellaneous overhead, etc.	Direct wages or direct labour hours or direct machine hours
Sundry and other expenses	Driect wages/DLH/ DMH e.g. Input → Process → output X Machine X HR X Raw material

1. A manufacturing organization has two production departments and two service departments. The following data are available in respect of the four departments:

Details	Production Department		Service Department	
	A	B	C	D
Area (sq. ft.)	450	300	270	150
No. of employees	72	48	36	24
Direct wages (Rs.)	24,000	18,000	12,000	6,000
H.P. of machines	800	600	400	200
Value of plant (Rs.)	72,000	54,000	36,000	18,000
Value of stock (Rs.)	45,000	27,000	18,000	-

The actual overhead costs for the period are as follows:

Items of Overheads	Amounts(Rs.)
Rent	6,000
Repairs	3,600
Depreciation	2,700
Light expenses	600
Supervision	9,000
Insurance of Stock	3,000
Group Insurance	900
Power	5,400

Required: Distribution of overhead costs to various departments.

Solution: **Manufacturing organization**

Overhead Distribution Summary

Details	Base	Total	Department			
			Production		Service	
			A	B	C	D
Direct wages	Given	18,000	-	-	12,000	6,000
Rent	Area	6,000	2,250	1,650	1,350	750
Repairs	Value of plant	3,600	1,440	1,080	720	360
Depreciation	Value of plant	2,700	1,080	810	540	270
Light expenses	Area [sq. ft.]	600	225	165	135	75
Supervision	No. of employee	9,000	3,600	2,400	1,800	1,200
Insurance of stock	Value of stock	3,000	1,500	900	600	-
Group insurance	No. of employees	900	360	240	180	120
Power	HP of machine	5,400	2,160	1,620	1,080	540
Primary Distribution	**-**	**49,200**	**12,615**	**8,865**	**18,405**	**9,315**

B. Secondary Distribution of Overhead

Service Departments	Bases
Personnel Department/Time keeping department /Canteen department	No. of employees
Stores Department	Direct materials/No. of store requisitions
Procurement department costs	No. of purchase orders
Workshop department	Direct Machine hours
Payroll Department	Direct Labour hours
Repairs and maintenance	Direct repair hours/Direct Machine hours
Purchase department	No. of purchase orders

2.

Details	Department			
	Production		Service	
	1	2	Repair	Store
Overhead from primary Distribution	40,000	50,000	10,000	8,000
Base:				
Repair hour	3,000	2,000	-	-
No. of Requisition	5	3	2	-

Required: Redistribution of overhead of service department:

a. Direct allocation method (DAM)
b. Step allocation method (SAM)
c. Which method is better and why?

Solution:

a.

State of secondary Distribution as per DAM

Details	Production Department		Service department	
	1	2	Repair	Store
Overhead from primary Distribution:	40,000	50,000	10,000	8,000
Repair (Repair hour 3:2)	6,000	4,000	(10,000)	-
Store(No.of Requisition 5:3)	5,000	3000	-	(8,000)
Total overheads	**51,000**	**57,000**	**NIL**	**NIL**

b.

Statement of secondary distribution as per SAM

Details	Production department		Service department	
	1	2	Repair	Store
Ohs from primary Distribution	40,000	50,000	10,000	8,000
Service Departments				
Store (No. of Requisition 5:3:2)	4,000	2,400	1,600	(8,000)
Repair (Repair hour 3:2)	6,960	4,640	(11,600)	-
Total overheads	**5,0960**	**5,7040**	**NIL**	**NIL**

d. Step allocation method will provide meaning full result. Under this method all bases are considered whereas under direct method all the bases are not consider at time of redistribution.

3.

Details	Production departments		Service departments	
	P_1	P_2	S_1	S_2
Overhead from Primary Distribution:	40,000	50,000	23,400	30,000
Service provided:				
S_1	50%	40%	-	10%
S_2	40%	40%	20%	-

Required: Redistribution of overhead of service department by using:

a. Simultaneous equation method
b. Repeated distribution method
c. Allocate service department cost to production department using trial and error method.

Solution:

a. Let, Total overhead of S_1 be x
Total overhead of S_2 be y
Now,
x = Rs 23,400 + 0.20 y …. (i)
y = Rs 30,000 + 0.10x … (ii)
Putting the value of y in equation (i)
x = Rs 23,400 + 0.20(Rs 30,000 + 0.10 x)
or, x = Rs 23,400 + 6,000 + 0.02x
or, x – 0.02 x = 29,400
or, $x = \frac{29400}{0.98}$
□ x = Rs 30,000
Putting the value of x in equation (ii) we get,
y = Rs 30,000 + (0.1 × Rs. 30,000)
= Rs 30,000 + Rs. 3,000 = Rs 33,000

Statement of redistribution

Details	Production Departments		Service departments	
	P_1	P_2	S_1	S_2
Overhead from primary Distribution	Rs 40, 000	Rs 50,000	Rs 23,400	Rs 30,000
Re_distribution of overhead of service Department:				
S_1 (5:4:1)	15,000	12,000	(30,000)	3,000
S_2 (4:4:2)	13,200	13,200	6,600	(33,000)
Total overhead	**68,200**	**75,200**	**NIL**	**NIL**

b.

Statement of secondary distribution as per repeated distribution method

Details	ProductionDepartments		Service department	
	P_1(Rs)	P_2(Rs)	S_1(Rs)	S_2(Rs)

Overhead from primary Distribution:	40,000	50,000	23,400	30,000
Redistribution of over Head of service department:				
S_1 (5: 4: 1)	11,700	9,360	(23,400)	2,340
S_2 (4:4:2)	12,936	12,936	6,468	(32,340)
S_1(5:4:1)	3,234	2587.20	(6,468)	646.80
S_2 (4: 4:2)	258.7	258.7	129.36	(646.8)
S_1 (5:4:1)	64.68	51.74	(129.36)	12.94
S_2(4:4:2)	5.18	5.18	2.588	(12.94)
S_1 (5:4:1)	1.294	1.03	(2.59)	0.26
S_2 (4:4:2) Adjusted	0.13	0.13	-	(0.26)
Total overhead	**68,200**	**75,200**	**NIL**	**NIL**

c. **Trial & Error Method**

Calculation of total oriented of service department

Details	S_1	S_2
Department overhead	23,400	30,000
$S_{1(10\%)}$	-	2,340
$S_{2\ (20\%)}$	6,468	-
$S_{1\ (10\%)}$	-	647
$S_{2\ (20\%)}$	129	-
$S_{1\ (10\%)}$	-	13
$S_{2\ (20\%)}$	3	-
Total overhead	**30,000**	**33,000**

Alternative Methods

Details	S_1	S_2
Department overhead	23,400	30,000
$S_{2\ (20\%)}$	6,000	-
$S_{1\ (10\%)}$	-	2,940
$S_{2\ (20\%)}$	588	-
$S_{1\ (10\%)}$	-	59
$S_{2\ (20\%)}$	12	-
$S_{1\ (10\%)}$	-	1
Total overhead	**30,000**	**33,000**

... Company

Statement of redistribution

Details	Production Departments		Service Department	
	P_1	P_2	S_1	S_2
Overhead from primary Distribution Rs distribution of overhead of service Department:	40, 000	50,000	23,400	R30,000
S_1 (5:4:1)	15,000	12,000	(30,000)	3,000
S_2 (4:4:2)	13,200	13,200	6,600	(33,000)
Total overhead	**68,200**	**75,200**	**NIL**	**NIL**

4.

2067 (I) Q. No. 1 (OR) The scenario of divisions of a factory are as follows:

	Production Divisions		Service Divisions	
	Casting	Making	Time-Keeping	Power Plant

Properties in Rs.	500,000	400,000	100,000	5,00,000
Area used in square meter	5,000	3,000	1,000	1,000
Labour Hours	4,000	2,000	1,000	1,000

The financial records of the cash outlay made for different expenses for the last month are as follows:

- Diesel for power plant was Rs. 2,000
- General overheads were Rs. 4,000
- Rent was Rs. 5,000
- Tax on properties was Rs. 3,000

The technical assessments of service divisions are as follows:

	Casting	Making	Time Keeping	Power Plant
Time Keeping	50%	40%	–	10%
Power Plant	40%	40%	20%	–

Required:

a. Distribution of overhead by using primary distribution method.
b. Secondary distribution by using simultaneous method. [3+4=7]

Solution

a. Statement showing Primary Distribution of Overhead

Details	Basis of allocation	Production Div.		Service Div.	
		Costing	Making	Time keeping	Power Plant
Diesel for power plant	(Given)	-	-	-	2,000
General overhead	Labour hrs (4:2:1:1)	2,000	1,000	500	500
Rent expenses	Area occupied (5:3:1:1)	2,500	1,500	500	500
Tax on properties	Value of property (5:4:1:5)	1,000	800	200	1,000
Total overhead		5,500	3,300	1,200	4,000

ii. Let x and y be the total overhead of time keeping and power plant department respectively.

Now,

$x = 1{,}200 + 0.2\,y$ ... (i)

Similarly,

$y = 4{,}000 + 0.10x$ ... (ii)

Putting the value of y in equation (i)

$x = 1200 + 0.2(4000 + 0.1x)$

$\therefore$ x = Rs. 2,041

Putting the value of x in equation (ii), then

$y = 4000 + 0.10 \times 2041$

$\therefore$ y = 4,204

Statement showing secondary distribution of overhead

Details	Costing division	Making division	Time keeping division	Power plant division
Overhead as per primary distribution	5,500	3,300	1,200	4,000

Re-allocation of service division	1,021	816	(2,041)	204
1. Time keeping div (5:4:1)	1,681	1,682	841	(4,204)
2. Power plant div (4:4:2)				
Total overhead	**8,202**	**5,798**	**Nil**	**Nil**

5.

2063 Q. No. 3 The Nepal Electronics Ltd; has been producing two leading brands of component, Band and Switch. The cost and other data relating to production have been summarized below:

Detailss	**Production Department**		**Service Departments**	
Products/Departments	**Band**	**Switch**	**Electricity**	**Stores**
Production units	10,000	10,000	-	-
Selling price per unit	Rs. 50	Rs. 60	-	-
Direct costs:				
Direct material cost per unit	Rs. 10	Rs. 15	-	-
Direct labour cost per unit	Rs. 20	Rs. 25	-	-
Total direct cost	Rs. 30	Rs. 40	-	-
Overhead cost as per primary distribution (Rs.)	Rs. 40,000	Rs. 50,000	Rs. 30,000	Rs. 10,000
Service rendered by Service Department:				
Stores	40%	40%	20%	-
Electricity	40%	50%	-	10%

Required:

a. Reapportionment of service departments cost to production by using simultaneous equations.

b. Sales volume of products for company Break even

Solution

a. Let, x and y be the total cost of electricity and stores respectively.

Then, total cost of electricity

$x = 30,000 + 0.20\ y$ ...(i)

And, Total cost of stores

$y = 10,000 + 0.10x$ ...(ii)

Putting the value of y in equation (i), then

$x = 30,000 + 0.20\ (10000 + 0.10x)$

$\therefore\ x = Rs.\ 32653$

Putting the value of x in equation (ii), then

$y = 10,000 + 0.10 \times 32,653$

$\therefore\ y = Rs.\ 13265$

Reapportionment of service department costs to production departments

Detailss	**Production department**		**Service department**	
	Band	**Switch**	**Electricity**	**Stores**
Overhead as per primary distribution	40,000	50,000	30,000	10,000
Reapportionment of electricity's overhead (4:5:1)	13,061	16,327	(32,653)	3,265
Reapportionment of store's overhead (4:4:2)	5,306	5,306	2,653	(13,265)

Total overhead costs	58,367	71,633	–	–

b. Here: Total fixed costs = Rs. 1,30,000
Selling price per unit = Rs. 50 and Rs. 60
Variable cost per unit = Rs. 30 and Rs. 40

Calculation of weighted CMPU

Department	CMPU	Sales mix	Weighted CMPU
Band	Rs. 20	$\frac{1}{2}$	Rs. 10
Switch	20	$\frac{1}{2}$	10
Weighted contribution margin per unit			Rs. 20

Therefore, company breakeven point = $\frac{\text{Fixed costs}}{\text{Weighted CMPU}} = \frac{\text{Rs. 1,30,000}}{\text{Rs. 20/unit}}$
= 6,500 units

Hence, Breakeven point of Band = $\frac{1}{2}\times$ 6,500 units = 3,250 units

Breakeven point of Switch = $\frac{1}{2}$ × 6,500 units = 3,250 units

6. **2017 April-May Q. No. 6** A company manufactures one main product and two by-products. During one period of production, the following data was complied.

	Main Product	By-product A	By-product B
Sales	Rs. 800,000	Rs. 64,000	Rs. 96,000
Costs after separation	80,000	12,800	14,400
Estimated net profit percentage to sales value	40%	20%	30%
Estimated selling expenses as percentage of sales value	20%	10%	15%

There are no beginning or ending inventories. Prepare an income statement concerning the period described using reverse cost method for by-products, if cost before separation is Rs. 310,400.

Solution:

Allocation of joint cost

Details	Main Product	By-product A	By-product B	Total
Net Sales revenue	8,00,000	64,000	96,000	9,60,000
Less: Net profit (40%,20%,30%)	3,20,000	12,800	28,800	3,61,600
Total cost of sales	480,000	51,200	67,200	5,98,400
Less: Further processing cost	80,000	12,800	14,400	107,200
Selling expenses	160,000	6,400	14,400	180,800
Allocated joint cost	2,40,000	32,000	38,400	3,10,400

Income statement

Details	Main	By-product	By-	Total

	Product	A	product B	
Net Sales revenue	800,000	64,000	96,000	960,000
Cost of goods sold				
Less: Allocated joint cost	240,000	32,000	38,400	3,10,400
After processing cost	80,000	12,800	14,400	107,200
Gross profit	480,000	19,200	43,200	542,400
Less: Selling expenses	160,000	6400	14,400	1,80,800
Net profit	3,20,000	12,800	28,800	361,600
Net profit margin	40%	20%	30%	–

7. **2017 April-May Q. No. 7** A manufacturing company provides you the following information.

	Departments				
	Production			Service	
	A	B	C	X	Y
Overhead as per primary distributions	Rs. 7,810	12,543	4,547	4,000	2,600
Exp. charged on percentage bases to:					
Department X	30%	40%	20%	–	10%
Department Y	10%	20%	50%	20%	–

Required: Allocate service department cost to production department using simultaneous equation method.

Solution:

Total overhead of service department X = 4,000 + 0.2Y ...(i)

Total overhead of service department Y = 2,600 + 0.1X ...(ii)

Putting the value of Y in equation (i) then,

$X = 4000 + 0.2 \times (2600 + 0.1X)$

or, $X = 4000 + 520 + 0.02X$

or, $X = \frac{4520}{0.98}$

$\therefore \quad X = 4612$

Putting the value of X in equation (ii)

$Y = 2600 + 0.1 \times 4612$

$\therefore \quad Y = 3061$

Details	Basis for Allocations	Production Department			Service Department	
		A	B	C	X	Y
Overhead as per primary distribution Re-allocation of service cost		7,810	12,543	4,547	4,000	2,600
X-department	Percentage (30:40:20:10)	1,384	1,845	922	(4,612)	461
Y-department	Percentage (10: 20:50:20)	306	612	1,531	612	(3,061)
Total overhead		**9,500**	**15,000**	**7,000**	**Nil**	**Nil**

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