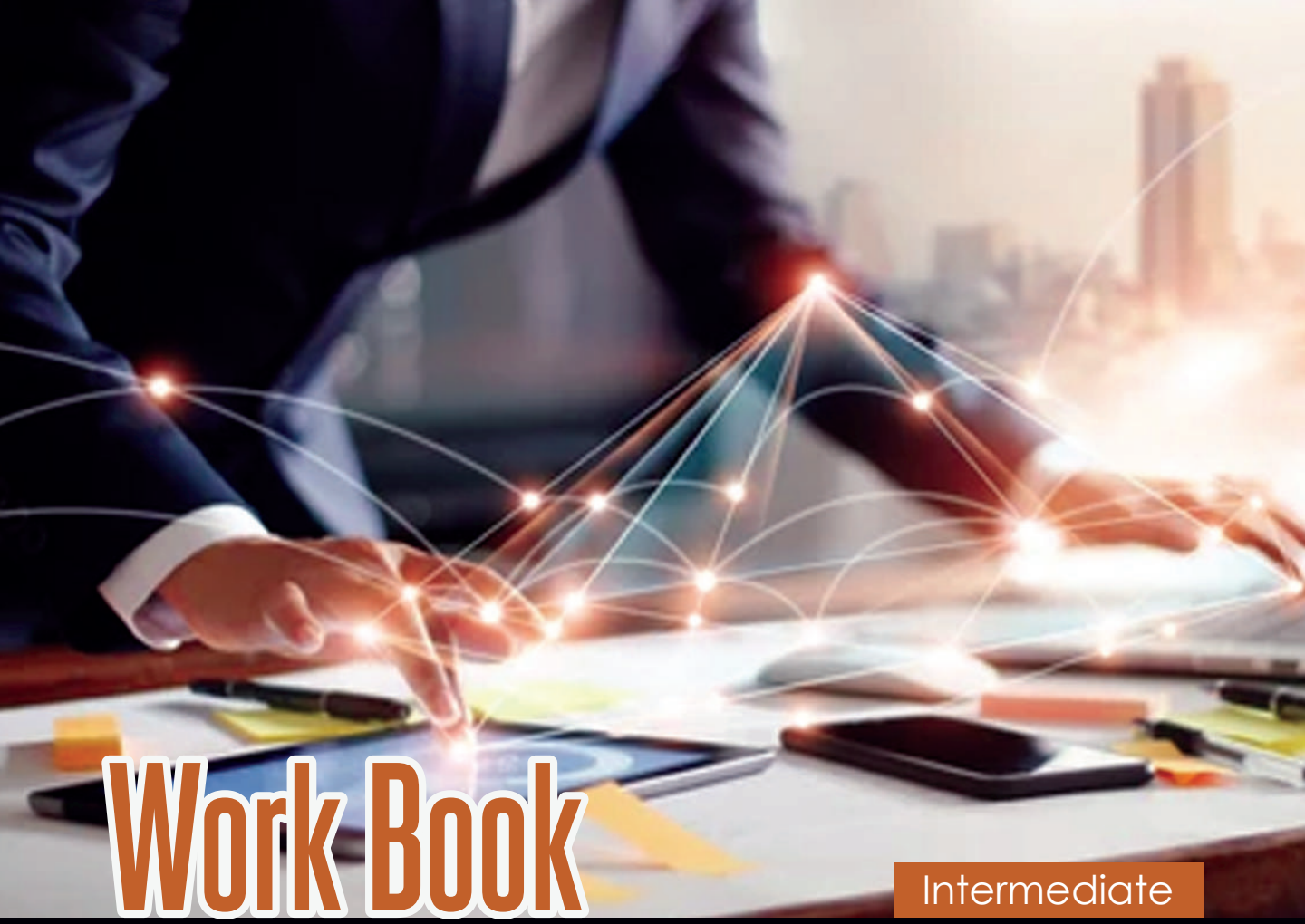

Work Book

Intermediate

Management Accounting

Paper 12

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WORK BOOK

Management Accounting

FINAL

Paper 12

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Preface

The landscape of professional education is undergoing a profound transformation, driven by the evolving demands of a globally integrated economy. In this dynamic environment, it is imperative to equip students not only with technical knowledge but also with the analytical skills and professional acumen essential for success.

Effective learning extends beyond theoretical understanding—it necessitates the development of strong conceptual foundations, critical thinking abilities, and disciplined study habits. These attributes are cultivated through continuous practice and engagement with thought-provoking academic material. To facilitate this process, the curriculum, instructional methods, and assessments must be designed to provide comprehensive, structured, and intellectually stimulating learning experiences.

Building on the success of the previous editions, we are pleased to present the **new edition of our 'Workbook' in an e-distributed format**. This edition has been meticulously developed to enhance students' comprehension and application of key concepts. Each chapter is structured to offer a seamless learning experience and integrating practical illustrations in a phased manner to align with the evolving regulatory framework.

We are confident that this new edition will continue to serve as a valuable academic resource, empowering students to achieve their professional aspirations with confidence and competence.

The Directorate of Studies

The Institute of Cost Accountants of India

INDEX

1 Activity Based Costing [Study Material - Module 2]

Illustration 1 :

QRS Ltd. a manufacturing company produces two products i.e., S and T. The particulars relating to two products are given below:

	Product S	Product T
Direct material cost per unit	10	12
Direct wages per unit	10	8
Units produced	200	200
Direct labour per unit	12	12
Material moves per product line	10	14

Budget material handling cost ₹24,000

i. Determine cost per unit of the products using volume based allocation method (Direct labour hour rate)

ii. Determine cost per unit of the products using ABC method

Solution :

Under traditional costing method, the amount of factory overhead i.e., material handling cost of ₹24,000 is to be absorbed on the basis of direct labour hour method.

Here, Total direct labour hours for product S and T= No.of Units produced* Direct labour hour per unit

= (200*12+200*12) [S and T both units are 200]

= 4800 labour hours

So, total factory overhead/total labour hours

= 24,000/4800= ₹5

i. Calculation of total cost per unit under traditional costing method for the products S and T :

Particulars	S	T
Direct material cost per unit	10	12
Direct wages per unit	10	8
Prime costs	20	20
Factory overhead : Material handling cost: Product S: 12 hrs * ₹ 5	60	
Product T: 12 labour hours *₹ 5		60
Total cost	80	80

ii. Under ABC, the factory overhead is to be absorbed on the basis of number of material moves in product lines.

Here total no of material moves = 10+14=24,

So factory overhead per material move = total factory overhead/total no of material moves = 24,000/24 = ₹1000

Thus, total factory overhead absorbed for product S(1000*10)= ₹ 10,000

Product T = (1,000*14) = 14,000

Statement showing computation of total cost per unit under ABC for the product S and T:

Particulars	S	T
DM COST	10	12
DIRECT WAGES	10	8
PRIME COSTS	20	20
Factory overhead: Material Handling costs [Product S: (10,000/200)]	50	
Product T: (14,000/200)		70
TOTAL COST	**70**	**90**

Illustration 2 :

PQR Ltd manufactures four products L, M, N & O In the same factory. The following information is given for a certain period-

Product	L	M	N	O
Good Output (number of units)	720	600	480	504
Average Yield (%)	80	80	96	90
Machine Hours per unit of Input	4	3	2	1

The Plant works such that after machining, the defectives in each run are automatically segregated and dumped separately in a container. The good units pass through the process and are further checked for quality by the inspectors of quality control who charge by the number of batches inspected.

The total Production and Selling Overheads of the Company are the following for the period –

Set-up Costs: ₹ 66,375

Machine Operation and Maintenance: ₹19,200

Stores Receiving: ₹21,400

Inspection: ₹ 24,000

Finished Goods - Packing/Despatch: ₹14,400

The following additional information is given -

1. A Material Requisition is made for every 25 units of Input.
2. Machines need to be set-up and tuned after each Production Run.
3. Production is in batches of 24 good units for all the products.
4. Units of L and M are packed in boxes that have 24 units capacity each and N and O are packed in smaller boxes of 12 units capacity. The smaller box costs half the price of the bigger box. Each box contains only one type of product. There is no product mix up in packing.

Choose appropriate Activity Cost Drivers for each Overhead Cost and calculate the Overhead Cost per unit of good output for each of the products under the ABC System.

Solution:

1. Basic Computations

Particulars	L	M	N	O	Total
(a)Good Output (number of units)(given)	720	600	480	504	
(b) Average Yield (given)	80%	80%	96%	90%	
(c) Input (a/b)	900	750	500	560	
(d) Machine hours p.u. of input (given)	4	3	2	1	
(e) Total Machine Hours required (c*d)	3600	2250	1000	560	7410
(f) No. of Material Requisitions (c) / 25	36	30	20	22.40	108.40
(g) No. of Prodn Runs (i.e. Set-ups)(a)/24	30	25	20	21	96
(h) No. of Boxes	(720/24) = 30	(600/24) =25	(480/12) =40	(504/12) =42	
(i) Box Cost/Quantity Ratio	1	1	0.5	0.5	
(j) Equivalent No. of Big Boxes (h*i)	30	25	20	21	96

2. Computation of ABC Recovery Rates

Activity	Activity Pool	Cost Driver	Cost Driver Quantity	ABC Rate
M/c Operation & Maint.	₹66,375	Machine hours	7,410 Machine Hours	₹8.957 per m/c hour
Setup	₹19,200	No. of Production Runs	96 Batches	₹200 per Batch
Stores Receiving	₹21,400	Material Requisition	108,40 Material Requisitions	₹197.42 per Material Requisition
Inspection	₹24,000	No. of Production Runs	96 Batches	₹250 per Batch
Finished Goods Packing	₹14,400	No. of Equivalent Boxes	96 Equivalent Boxes	₹150 per Equi. Box

Note: In respect of Finished Goods Packing, Cost per big box - for L and M (24 units) = 150 per box, and Cost per Small Box for N and O (12 units) = 150/2=75 per box.

3. Cost Statement under Activity Based Costing (₹)

Product	L	M	N	O	Total
Machine Operation	3,600 x 8.957 = 32,246	2,250 x 8.957 =20,154	1,000 x 8.957 =8,957	560 x 8.957 =5,016	66,375
Setup	30*200=6000	25*200= 5000	20*200=4000	21*200=4200	19200
Stores Receiving	36 × 197.42 =7107	30 × 197.42 =5,923	20 × 197.42 =3,948	22.40 × 197.42 =4,422	21,400
Inspection	30*250 = 7,500	25*250=6,250	20*250=5000	21*250 = 5250	24,000
Fin.Goods Packing	30*150= 4,500	25*150=3750	20*150=3000	21* 50 = 3150	14,400
Total Overhead Cost	57,353	41,077	24905	22040	1,45,375
Good Output	720 units	600 units	480 units	504 units	
Overhead Rate p.u	₹79.66	₹68.46	₹51.89	₹43.73	

Illustration 3 :

During the last 20 years, KL Ltd's manufacturing operation has become increasingly automated with computer-controlled robots replacing Operator. KL currently manufactures over 100 products of varying levels of design complexity. A single Plant-wise Overhead Absorption Rate, based on Direct Labour Hours is used to absorb Overhead Costs.

In the quarter ended March, KL's Manufacturing Overhead Costs were - (₹ '000)

Equipment Operation Expenses	125
Equipment Maintenance Expenses	25
Wages paid to Technicians	85
Wages paid to Component Stores Staff	35
Wages paid to Despatch Staff	40
Total	**310**

During the quarter, the Company reviewed the Cost Accounting System and concluded that absorbing Overhead Costs to Individual products on a labour hour absorption basis was meaningless and that Overhead Costs should be attributed to products using an Activity Based Costing (ABC) System. The following are identified as at most significant activities:

1. Receiving Component Consignments from Suppliers.
2. Setting up Equipment for Production Runs
3. Quality Inspections
4. Despatching Goods as per Customers' Orders.
    - Equipment Operation and Maintenance Expenses are apportioned as - Component Stores 15%, Production Runs 70% and Despatch 15%
    - Technicians' Wages are apportioned as - Equipment Maintenance 30%, Set Up Equipment for Production Runs 40% and Quality Inspections 30%.

During the quarter-

1. 980 Component Consignments were received from Suppliers.
2. 1020 Production Runs were set up
3. 640 Quality Inspections were carried out.
4. 420 Orders were despatched to customers.

KLs' production during the quarter included Component R. The following information is available on Component R:

Component Consignments received	45
Production Runs	16
Quality Inspections	10
Orders (goods) despatched	22
Quantity produced	560

Calculate the unit manufacturing OH Cost of Component R using ABC System

Solution:

Particulars	Receipt from Suppliers	Set-up	Inspection	Despatch	Total
(a)Technician's Wages (**Note 1**)	-	34,000	25,500	-	59,500
(b) Equipment Operation and Maintenance Expenses apportioned as 15:70:15 (**Note 2**)	26,325	1,22,850	-	26,325	1,75,500

(c)Wages to Storemen & Despatch Staff (Direct)	35000	-	-	40000	75000
1. Total OH = Activity Cost Pool	61,325	156850	25500	66325	310000
2. Cost Allocation Base (i.e. Cost Driver)	980 Consignments	1020 Production Runs	640 Quality Inspection	420 Orders Dispatched	
3. ABC Recovery Rate = (1/2)	₹62.58 Per Consignments	₹153.77 Per Production Runs	₹39.84 Per Inspection	₹157.92 Per Dispatched	
4. Resources required for Component R	45 consignments	16 Runs	10 inspection	22 Orders	
5. OH Cost of Comp. R (for 560 units) (3 x 4)	₹2816.10	₹2460.32	₹398.40	₹3474.24	₹9149.06
6. OH Cost per unit of Component R					**₹16.34**

NOTE:

1. Technician's Wages Total 85,000, 30% thereof = ₹25,500 is included in Equipment Maintenance Expenses, and the balance of 59,500 is apportioned to Set Up and Inspection as 40: 30, l.e. ₹34,000 & ₹25,500,

Total Equipment Operation and Maintenance Expenses= 125000+25,000+ 25,500 (from Note 1 above) = 1,75,500. This is apportioned in the ratio 15%: 70%: 15% to the relevant activities.

Illustration 4 :

SML ltd. is engaged in production of three types of ice-cream products: Coco, Strawberry and Vanilla The Company presently 50,000 units of Coco at 25 per unit, Strawberry 20,000 at 20 per unit and Vanilla 60,000 units at 15 per unit. The demand is sensitive to Selling Price, and it has been observed that every reduction of ₹1 per unit in selling price increases the demand for each product by 10% to the previous level. The Company has the production capacity of 60,500 units of Coco, 24,200 units of Strawberry and 72,600 units of Vanilla. The Company marks up 25% on cost of the product.

The Company management decides to apply ABC analysis. For this purpose, It identifies four activities and the rate as follows:

Activity	**Cool Rate**
Ordering	₹800 per Purchase Order
Delivery	₹700 per Delivery
Shelf Stocking	₹199 per Hour
Customer Support and Assistance	₹1.10 p.u. sold.

The other relevant information of the products at 100% production capacity levels are as follows:

Particulars	Coco	Strawberry	Vanilla
Direct Material pu (₹)	8	6	5
Direct Labour p.u (₹)	5	4	3
No. of Purchase Orders	35	30	15
No. of Deliveries	112	66	48
Shell Stocking Hours	130	150	160

Under the Traditional Costing System, Store Support Costs are charged at 30% of Prime Cost. In ABC, these costs are coming under customer support and Assistance.

Required:

1. Calculate target cost for each product after a reduction of selling price required to achieve the sales equal to the production capacity.
2. Calculate the Total Cost and Unit Cost of each product at the maximum level using Traditional Costing.
3. Calculate the Total Cost and Unit Cost of each product at the maximum level using Activity Based Costing.
4. Compare the Cost of each product calculated in (i) and (ii) with (iii) and comment on it.

Solution:

1. Computation of New Selling Price to achieve 100% Production Capacity

Coco		Strawberry		Vanilla	
Price (₹)	Quantity (Units)	Price (₹)	Quantity (Units)	Price (₹)	Quantity (Units)
25	50,000	20	20,000	15	60,000
25-1=24	50,000+10% = 55,000	20-1=19	20,000+10% = 22,000	15-1=14	60,000+10%=66,000
24-1=23	55.000 -10% = **60,500**	19-1=18	22,000+10%= **24,200**	14-1=13	66,000+10%=**72,600**

2. Computation of Target Cost to achieve 100% Capacity

Particulars	Coco	Strawberry	Vanilla
(a) Total Production Capacity	60,500 Units	24,200 Units	72,600 Units
(b) Proposed Selling Price as per WN 1 above	₹ 23.00	₹18.00	₹ 13.00
(c) Profit Margin at 25% on Cost (1/4th on Cost =1/5th on sale)	₹4.60	₹ 3.60	₹ 2.60
(d) Target Cost p.u	**₹18.40**	**₹14.40**	**₹10.40**

3. Computation of Cost under Traditional Costing

Particulars	Coco	Strawberry	Vanilla
(a) Direct Material p.u	₹8.00	₹ 6.00	₹5.00
(b) Direct Labour p.u	₹5.00	₹ 4.00	₹3.00
(c) Prime Cost (a + b)	₹ 13.00	₹ 10.00	₹ 8.00
(d)Store Support 30% of Prime Cost (c)	₹3.90	₹3.00	₹2.40
(e) Total Cost p.u	₹16.90	₹ 13.00	₹10.40
(f) 100% level Output Quantity	60,500 units	24,200 units	72,600 units
(g) Total Costs (e × f)	₹10,22,450	₹3,14,600	₹7,55,040
(h)Target cost p.u. as per Wn 2	₹18.40	₹ 14.40	₹10.40
(i) Comments (e) vs (h)	₹1.50 cost further saved when compared to Target cost	₹1.40 cost further saved when compared to Target cost	Target cost just achieved

4. Computation of Total Cost & Unit Cost using ABC

Particular	**Coco (₹)**		**Strawberry (₹)**		**Vanilla (₹)**	
	P.u.	**Total**	**P.u.**	**Total**	**P.u.**	**Total**
Output quantity		60,500 units		24,200 units		72,600 units
Direct Material	8.00	4,84,000	6.00	1,45,200	5.00	3,63,000
Direct Labour	5.00	3,02,500	4.00	96,800	3.00	2,17,800
Cost of Purchase order	0.46	(800 * 35) 28,000	0.99	(800 * 30) 24,000	0.17	12,000 (800*15)
Cost of Delivery	1.30	(700 * 112) 78,400	1.91	(700 * 66) 46,200	0.46	33,600 (700*48)
Shelf Stocking	0.43	(199 * 130) 25,870	1.23	(199 * 150) 29,850	0.44	31,840 (199*160)
Customer Support & Assistance	1.10	66,550	1.10	26,620	1.10	79,860
(a) ABC Cost p.u.	16.29	9,85,320	15.23	3,68,670	10.17	7,38,100
(b) Target Cost p.u.	18.40		14.4		10.40	
(c)Comments (a vs b)	2.10 cost further saved when compared to Target Cost		0.83 further cost reduction required.		0.23 cost further saved when compared to Target Cost	

Illustration 5 :

Vegetable Basket store has decided to increase the size of the store. It wants the information about the probability of the individual product lines:

Potato, Tomato and Onion. It provides the following data for the 2024 for each product line:

	Potato	Tomato	Onion
Revenues	₹79,350.00	₹2,10,060.00	₹ 1,20,990.00
Cost of goods sold	₹ 60,000.00	₹ 1,50,000.00	₹ 90,000.00
Cost of Bags returned	₹ 1,200.00	₹ 0	₹ 0
Number of purchase Orders placed	36	84	36
Number of deliveries received	30	219	66
Hours of shelf stocking time	54	540	270
Items sold	**12,600**	**1,10,400**	**30,600**

Vegetable Basket also provides the following information for the year 2024:

S.No	Activity	Description of Activity	Total costs (₹)	Cost allocation basis
1.	Bag returns	Returning of empty bag to the store	1,200.00	Direct tracing to product line
2.	Ordering	Placing of orders of purchases	15,600.00	156 purchase orders
3.	Delivery	Physical delivery and the receipts of merchandise	25,200.00	315 deliveries
4.	Self-stocking	Stocking of merchandise on store shelves and ongoing restocking	17,280.00	864 hours of time
5.	Customer Support	Assistance provided to customers including bagging and checkout	30,720.00	1,53,600 items sold

Required:

(i) Vegetable Basket currently allocates store support costs (all costs other than the cost of goods sold) to product line on the basis of the cost of goods sold of each product line. Calculate the operating income and operating income as the percentage of revenue of each product line.

(ii) If Vegetable Basket allocates store support costs (all costs other than the cost of goods sold) to the product lines on the basis of ABC system, Calculate the operating income and operating income as the percentage of revenue of each product line.

(iii) Compare both the system.

Solution:

(i) Traditional Costing System

Particulars	Potato	Tomato	Onion	Total
Revenue	79,350	2,10,060	1,20,990	4,10,400
Less: Cost of Goods sold (COGS)	60,000	1,50,000	90,000	3,00,000
Less: Store Support Cost	18,000	45,000	27,000	90,000
Operating income	1,350	15,060	3,990	20,400
Operating income %	1.70%	7.17%	3.30%	4.97%

(ii) ABC System

Overhead Allocation Rate

Activity	Cost Hierarchy Level	Total Costs (₹)	Quantity of Cost Allocations Base	Overheads Allocation rate
Ordering	Batch	15600	156 Purchase orders	₹ 100
Delivery Self	Batch	25200	315 delivering orders	₹ 80
Stocking	Output unit	17280	864 self-stocking hours	₹ 20
Customer Support	Output unit	30720	153600 items sold	₹ 0.20

Store Support Cost

Particular	Cost Driver	Potato	Tomato	Onion	Total
Bag Returns	Direct	1200	0	0	1200
Ordering	Purchase orders	3600	8400	3600	15600
Delivery	Deliveries	2400	17520	5280	25200
Self-Stocking	Hours of time	1080	10800	5400	17280
Customer Support	Items Sold	2520	22080	6120	30720
Grand Total		10800	58800	20400	90000

Operating Income

Particulars	Potato	Tomato	Onion	Total
Revenue	79350	210060	120990	410400
Less: Cost of Goods sold	60000	150000	90,000	300000
Less: Store support Cost	10800	58800	20400	90000
Operating income	8550	1260	10590	20400
Operating income%	10.78%	0.60%	8.75%	4.97%

Summary/Comparison

Particulars	Potato	Tomato	Onion	Total
Under Traditional Costing System	1.70%	7.17%	3.30%	4.97%
Under ABC System	10.78%	0.60%	8.75%	4.97%

The Tomato line drops sizably when ABC is used. Although it constitutes 50% COGS, it uses a higher percentages of total resources in each activity area, especially the high cost of customer support area. In contrast, Potato line draws a much lower percentage of total resources used in each activity area than its percentages of total COGS. Hence under ABC, Potato is most profitable. Vegetable basket can explore ways to increase sales of Potato and also explore price increases on Tomato.

Operating Income Ranking is highest for Tomato under Traditional system because other products bear its overheads cost, whereas under ABC a more accurate picture shows Tomato as the lowest ranking product.

Illustration 6 :

SH Ltd. manufactures four products, namely P, Q, R and S using the same plant and process. The following information relates to a production period:

Product	P	Q	R	S
Output in Units	720	600	480	504

The four products are similar and are usually produced in production runs of 24 units and sold in batches of 12 units. The total overheads incurred by the company for the period are as follows:

	₹
Machine operation and maintenance cost	**63,000**
Setup costs	20,000
Store receiving	15,000
Inspection	10,000
Material handling and dispatch	2,592

During the period the following cost drivers are to be used for the overhead cost:

Cost	Cost driver
Setup Receiving	No. of production runs
Store receiving	Requisition raised
Inspection	No. of production runs
Material handling and ispatch	Orders Executed

It is also determined that:

- Machine operation and maintenance cost should be apportioned between setup cost, store receiving and inspection activity in the ratio 4:3:2.
- Number of requisition raised on store is 50 for each product and the no. of orders executed is 192, each order being for a batch of 12 units of a product.

Calculate the total overhead cost per unit of each product using activity based costing after finding activity wise overheads allocated to each product.

Solution:

1. Computation of ABC Recovery Rates

Activity	Activity Cost Pool	Cost Driver	Quantity	ABC Rate
Set Up	20,000+28,000=₹48,000	No. of Production Runs	96	₹500 per Run
Stores Receiving	15,000+21,000=₹36,000	Requisitions raised	50×4=200	₹180 per Reqn.
Inspection	10,000+14,000=₹24,000	No.of Production Runs	96	₹250 per Run
Material Handling	Given=₹2,592	Orders executed	192	₹13.5 per Batch

Note:

- Machine Operation and Maintenance Cost of ₹ 63,000 is apportioned to the first three activates in the ratio 4:3:2, i.e. ₹ 28,000, ₹ 21,000 and ₹ 14,000
- Number of Production Runs and Number of Batches are computed as under:

Product	P	Q	R	S	Total
(a)Output Quantity	720 units	600 units	480 units	504 units	
(b) Quantity per Production Run	24 units	24 units	24 units	24 units	
(c) Number of Production Runs (a ÷ b)	30 runs	25 runs	20 runs	21 runs	96 runs
(d) quantity per Batch Order	12 units	12 units	12 units	12 units	
(e) Number Batches (a ÷ b)	60 batches	50 batches	40 batches	42 batches	192 batches

2. Computation of OH Costs using ABC System

Product	P	Q	R	S	Total
Set up	500×30= ₹15,000	500×25= ₹12,500	500×20= ₹10,000	500 × 21= ₹ 10,500	₹48,000
Stores Receiving	₹9,000	₹9,000	₹9,000	₹9,000	₹36,000
Inspection	250×30 =₹7,500	250×25 =₹6,250	250×20 = ₹5,000	250 × 21 = ₹5,250	₹24,000
Material Handling	13.50×60 =₹810	13.50 × 50 = ₹675	13.50×40= ₹540	13.50 × 42 = ₹567	₹2,592
a) Total OH Cost	₹ 32,310	₹ 28,425	₹ 24,540	₹ 25,317	₹1,10,592
b) Output Quantity	720 units	600 units	480 units	504 units	
c) OH Cost P.u.	₹ 44.875	₹ 47.375	₹ 51.125	₹ 50.232	

Illustration 7 :

GHK Company manufactures several products of varying design and models. It uses a single overhead recovery rate based on direct labour hours The overheads incurred by the Company in the first half of the year are as under:

	₹
Machine operation expenses	20,25,000
Machine maintenance expenses	3,75,000
Salaries of technical staff	12,75,000
Wages and salaries of store staff	5, 25,000

During this period, the company introduced activity based costing system and the following significant were activities were identified:

- Receiving materials and components
- Set up of machines for production runs
- Quality inspection

It is also determined that:

- The machine operation and machine maintenance expenses should be apportioned between store and production activity in 1:4 ratio.
- The technical staff salaries should be apportioned between machine maintenance, set up and quality inspection in 3:4:4 ratios.

The following outlines the activity consumption during the period under review:

- Direct labour hours worked 80,000
- Production set-ups 4,080
- Material and components consignments received from suppliers 3,920
- Number of quality inspection carried out 2,560

The direct wages rate is ₹12 per hour.

The data relating to two products manufactured by the company during the period are as under:

			P	Q
Direct Materials costs	₹		**12,000**	**8,000**
Direct labour hours	Hrs.		960	100
Direct Materials Consignments received	nos		48	52
Production runs	nos.		36	24
Number of quality inspection done	nos.		30	10
Quantity Produced	**Unit in nos.**	**15,000**		**5,000**

A potential customer has approached the company for the supply of 24,000 units of a component 'R' to be delivered in lots of 3000 units per quarter. The job will involve an initial design cost of ₹60,000 and the manufacture will involve the following per quarter

Direct Materials costs	₹	12,000
Direct labour hours	Hrs.	300
Production runs	nos.	6
Inspection	nos.	24
Number of consignment of direct materials to be received	nos.	20

You are required to

1. Calculate the cost of products P and Q based on the existing system of single overheads Recovery rate.
2. Determine the most of products P & Q using Activity Based Costing system.
3. Compute the sales values per quarter of components 'R' using Activity Based Costing system (considering a mark-up of 25% on cost)

Solution:

1. Statement of Computation of Unit Cost of Product P & Q on the Existing System

Particulars	**P (₹)**	**Q(₹)**
Direct Material	12,000	8,000
Direct Labour Cost	11,520 (₹12×960 hr.)	1,200 (₹12×100 hr.)
Overheads (Direct Labour Hours × ₹52.5 per hour)	50,400	5,250
Total Cost	73,920	14,450
Quantity Produced (units)	15,000	5,000
Cost per unit	4.928	2.89

Single Factory Direct Labour Hour Overhead Rate

= ₹42,00,000/80,000 labour hours

= ₹52.50 per Direct Labour Hour

2. Working:

Apportionment of Overhead (Amount in ₹)

Particulars	**Receiving upplies**	**Setups**	**Quality nspection**	**Total**
Machine Operation Expenses (1:4)	4,05,000 (₹ 20,25,000 × 1/5)	16,20,000 (₹ 20,25,000 × 4/5)	-	20,25,000
Maintenance (1:4)	1,51,500 (₹7,57,500 ×1/5)	6,06,000 (₹7,57,500 ×4/5)	-	7,57,000 (1)
Salary of Technical Staff	-	5,10,000 (₹12,75,000 ×4/10)	3,82,500 (₹12,75,000 ×3/10)	8,92,500 (2)
Wages & Salary of Stores Staff	5,25,000	-	-	5,25,000
Total	10,81,500	27,36,000	3,82,500	42,00,000

(1) ₹3, 75,000 + Share of Technician's Salary (₹12, 75,000 × 3/10)

(2) ₹12, 75,000 – Share to Machine Maintenance (₹12, 75,000 ×3/10)

To identify the cost drivers for each activity and establish cost driver rates by dividing the activity costs by a measure of cost driver usage for the period.

Calculation of Activities Cost Driver Rate

Overheads	**Activity Cost Driver Rate**
Receiving Supplies [₹10,81,500/3,920]	₹275.89 Per consignment
Performing Setups [₹27,36,000/4,080]	₹670.59 per setup
Quantity Inspection [₹3,82,500/2,560]	₹149.41 per quality inspection

Thus, costs are assigned to components based on their cost driver usage. The assignments are as follows:

Statement of determination of the Cost of product P&Q.

Activity Based System

Particulars	**P (₹)**	**Q (₹)**
Direct Materials	12,000	8,000
Direct Labour @ ₹12 per hour	11,520	1,200
Receiving Supplies	13,243 (₹275.89 × 48 Con.)	14,346 (₹275.89 × 52 Con.)
Performing Setups	24,141 (₹670.59 × 36 Set- ups)	16,094 (₹670.59 × 24 Set-ups)
Quality Inspections	4,482 (₹149.41 × 30QI)	1,494 (₹149.41 × 10 QI)
Total Costs	65,386	41,134
No.of Units Produced	15,000	5,000
Cost Per Unit	4.36	8.23

3. Calculation of Sales Value per quarter f Component 'R' (using ABC)

Particulars of Costs	**Amount (₹)**
Direct Materials	12,000
Direct labour (@ ₹12 per hour)	3,600 (₹12 × 300 Hr.)
Initial design Cost (₹60,000 ÷ 8 Quarter)	7,500
Receiving Supplies	5,518 (₹275.89 × 20 Con.)
preforming Setups	4,024 (₹670.59 × 6 Set-ups)
Quality Inspections	3,586 (₹149.41 × 24 QI)
Total Costs	36,228
Add: Margin 25% of ₹36,228	9,057
Total Sales Value	45,285

Illustration 8:

LMN Ltd. is a multiproduct company, manufacturing three products L,M and N. The budgeted costs and production for the year ending 31st March are as follows:

	L	M	N
Production quantity (Units)	4,000	3,000	1,600
Resources per Unit - Direct Materials (Kg) -Direct Labour (Minutes)	4 30	6 45	3 60

LMN Ltd. had originally set a budgeted direct labor rate of ₹10 per hour, with a material cost budgeted at ₹2 per kilogram. The company had planned for production overheads amounting to ₹99,450, which were allocated to products based on the direct labor hour rate under the Absorption Costing System.

However, LMN Ltd. is now exploring the possibility of transitioning to an Activity-Based Costing (ABC) system. To facilitate this shift, additional relevant information has been provided for analysis and consideration.

1. Budgeted overheads were analysed into the following:

	(₹)
Material handling	29,100
Storage costs	31,200
Electricity	39,150

2. The cost drivers identified were as follows:

Material handling	Weight of material handled
Storage costs	Number of batches of material
Electricity	Number of Machine operations

3. Data on Cost Drivers was as follows:

	L	M	N
For complete production:			
Batches of material	10	5	15
Per unit of production:			
Number of Machine operations	6	3	2

You are requested to:

1. Prepare a comprehensive statement for management that outlines the unit costs and total costs of each product based on the Absorption Costing method
2. Prepare a detailed statement for management that presents the product costs of each product under the Activity-Based Costing (ABC) approach.
3. State what are the reasons for the different product costs under the two approaches?

Solution:

1. Traditional Absorption Costing

Particulars	L	M	N	Total
(a) Quantity (units)	4,000	3,000	1,600	8,600
(b) Direct labour (minutes)	30	45	60	-
(c) Direct labour hours (a* b)/60 minutes	2,000	2,250	1,600	5,850

Overhead rate per direct labour hour.

=Budgeted overheads ÷ Budgeted labour hours

=₹ 9,450-5,850 hours

= ₹ 17 per direct labour hour

Unit costs:

	L	M	N
Direct Cost:			
-Direct labour	5.00	7.50	10.00
-Direct Material	8.00	12.00	6.00
Production Overhead	8.50 (₹17×30/60)	12.75 (₹17×45/60)	17.00 (₹17×60/60)
Total Unit Costs	21.50	32.25	33.00
Number of units	4000	3000	1600
Total costs	86,000	96,750	52,800

2. Activity based Costing

	L	M	N	Total
Quantity (units)	4,000	3,000	1,600	-
Material Weight per unit (kg)	4	6	3	-
Total material weight	16000	18000	4800	38800
Machine operations per unit	6	3	2	-
Total operations	24000	9000	3200	36200
Total batches of material	10	5	15	30

Material handling rate per kg = ₹29,100/38,800 kg = ₹0.75per kg

Electricity rate per machine operations = ₹39,150/36,200 = ₹1.081 Per machine operations

Storage rate per batch= ₹31200/30 batches = ₹1,040 per batch

Unit Cost

	L (₹)	M (₹)	N (₹)
Direct Costs:			
Direct Labour	5.00	7.50	10.00
Direct material	8.00	12.00	6.00
Production Overheads:			
Material Handling	3.00 (₹0.75×4)	4.50 (₹0.75×6)	2.25 (₹0.75×3)
Electricity	6.49 (₹1.081×6)	3.24 (₹1.081×3)	2.16 (₹1.081×2)
Storage	2.60 (₹10× .1,040/4,000)	1.73 (₹5× ₹1,040/3,000)	9.75 (₹ 15×₹1,040/1,600)
Total unit costs	25.09	28.97	30.16
Number of units	4,000	3,000	1,600
Total costs	₹1,00,360	₹86,910	₹48,256

3. Comments: The difference in the total costs under the two systems is due to the differences in the overheads borne by each of the products. The Activity Based Costs appear to be more precise.

Illustration 9 :

TQR Limited has collected the following data for its two activities. It calculates activity cost rates based on cost driver capacity.

Activity	Cost Driver	Capacity	Cost
Power	Kilowatt hours	50,000 kilowatt hours	₹2,00,000
Quality inspections	Number of inspections	10,000 Inspections	₹3,00,000

The company makes three products T, Q and R. For the year ended March 31st, the following consumption of cost drivers was reported:

Product	Kilowatt hours	Quality Inspections
T	10,000	3,500
Q	20,000	2,500
R	15.000	3,000

Required:

(i) Compute the costs allocated to each product from each activity

(ii) Calculate the cost of unused capacity for each activity.

Solution:

(i) Statement of cost allocation to each product from each activity.

	Product			
	T (₹)	**Q (₹)**	**R (₹)**	**Total (₹)**
Power (Refer to working note)	40,000 (10,000 kWh × ₹4)	80,000 (20,000 kWh × ₹4)	60,000 (15,000 kWh × ₹4)	1,80,000
Quality Inspections (Refer to working note)	1,05,000 (3,500 inspections × ₹30)	75,000 (2,500 inspections × 30)	90,000 (3,000 inspections × ₹30)	2,70,000

Working note

Rate per unit of cost driver:

Power	(₹2,00,000/50,000 kWh)	₹4/kWh
Quality Inspection	(₹3,00,000/10,000 inspections)	₹30 per inspection

(ii) Computation of cost of unused capacity for each activity:

	₹
Power (2,00,000-1,80,000) or 5,000 x 4	20,000
Quality Inspections (₹3,00,000-2,70,000) or 1,000 x 30	30,000
Total cost of unused capacity	50,000

Illustration 10 :

K.O. Company has furnished the following particulars in respect of two products S & T. S is a newly introduced product with some technical problems requiring substantial engineering changes. On the other hand, Product T is a mature and established product and thus not required much attention regarding engineering changes.

Particulars	**S**	**T**
Output units	2000	2000
Engineering changes notices per product line	30	18
Unit cost per engineering change notice	1500	1500
Machine hours required per unit	4	8

You are required to:

1. Ascertain overhead cost per unit of each product by using traditional machine hour rate method

2. Ascertain overhead cost per unit of each products using ABC

3.Comment on the results

Solution:

Statement showing computation of cost per unit under traditional machine hour rate method

PARTICULARS	S	T
Total machine required	(2,000*4) 8,000	(2,000*8) 16,000
Machine hour rate (Note1)	3	3
Total overhead cost	24,000 (8,000*3)	48,000(16,000*3)
Unit produced	2,000	2,000
Cost per unit	**12**	**24**

Note 1: Machine hr rate: Budgeted engineering change costs/ budgeted machine hour

= [(30+18)* 1500]÷[8,000+16,000]

= 72,000/24,000= ₹3

Under this conventional system, it is noticed that product S has much lower cost per unit even though it consumes more than one and half times as much engineering cost than Product T. Thus this system fails to stress the high level of engineering changes for the product T. Product T wrongly absorbs more engineering costs because it consumes more machine hours. This situation can be expressed as a cross subsidy in which one product wrongly absorbs the cost that are belonging to the another product. Product S seems to be cheaper because under the conventional costing overhead costs are averaged. But here the appropriate cost driver should be engineering changes notices and not the machine hours.

b) Under ABC the engineering changes notice costs are allocated to the products on the basis of engineering changes notices rather than machine hour

Statement showing computation of costs per unit ABC system

Particulars	S	T
(a)Engineering changes notices per product line	30	18
(b)Cost per engineering changes notice	1500	1500
(c)Engineering changes notice costs applied per product line (a*b)	45,000	27,000
(d)Unit produced	2000	2000
Engineering changes notice costs per unit (c/d)	22.5	13.5

The fact that product S consumes more than one and half times of engineering activity and it has been reflected through per unit engineering change notice cost by using ABC

Illustration 11 :

XYZX Co. Produces three products X,Y & Z ,their per unit cost data are given below:

Particulars	X	Y	Z	Total
Unit produced	10,000	20,000	30,000	
Direct material cost per unit	50	40	30	
Direct labour cost per unit	30	40	50	
Labour hours per unit	3	4	5	
Machine hours per unit	4	4	7	
No of purchase requisition	1200	1800	2000	5000
No of machine set ups	240	260	300	800

Production overhead ₹26,00,000 split into two departments: Department 1: 11,00,000, Department 2: 15,00,000

Department 1 is labour intensive and Department 2 is machine intensive.

Total labour hours in Department 1 = 1,83,333

Total machine hours in department 2 = 5,00,000.

Production overheads split into two ₹26,00,000. Receiving and inspection: 14,00,000, Production scheduling and machine set up: 12,00,000

You are required to prepare product cost statement under Traditional method and Activity method

Solution:

- **Traditional method**

Statement of cost

Particulars	X	Y	Z
Direct material cost per unit	50	40	30
Direct labour cost per unit	30	40	50
Prime cost	80	80	80
Overhead department 1 (labour hr * rate)	18	24	30
Department 2 (machine hr * rate)	12	12	21
Total cost per unit	110	116	131

Overhead absorption rate:

Department 1: 11,00,000/ 1,83,333= ₹6 /labour hr

Department 2: 15,00,000/ 5,00,000= ₹3 machine hour

- **Activity based costing**

Using ABC method, the overhead costs are absorbed according to the cost drivers rate: Receiving and inspection= 14,00,000/ 5,000= ₹280 per requisition

Scheduling and set up= 12,00,000/ 800= ₹1500 per set up

Particulars	**X**	**Y**	**Z**
Direct material cost per unit	50	40	30
Direct labour cost per unit	30	40	50
Prime cost	80	80	80
Overhead Receiving and inspection: X: 280*1200/10,000 Y: 280*1800/20,000 Z:280*2000/30,000	32.60	25.20	18.67
Production scheduling X:1500*240/10,000 Y: 1500*260/20000 Z: 1500*300/30,000	36.00	19.50	15.00
Total cost	148.60	124.70	113.67

2 Marginal Costing [Study Material - Module 3]

Illustration 1 :

1. A company has annual fixed cost of ₹14,00,000. In 2023 sales amounted to ₹60,00,000 as compared with ₹ 45,00,000 in 2022 and profit in 2023 was ₹4,20,000 higher than in 2022.
2. At what level of sales does the company break-even?
3. Determine profit or loss on a precast sales volume of ₹ 85,00,000.
4. If there is a reduction in selling price in 2024 by 10% and the company desires to earn the same profit as in 2023, what would be the required sales volume?

Solution :

$$\text{PV ratio} = \frac{\text{Increase in profit}}{\text{Increase in sales}} \times 100$$

$$= \frac{4,20,000}{15,00,000} \times 100$$

$$= 28\%$$

1. $$\text{Break-even sales} = \frac{\text{Fixed costs}}{\text{PV ratio}} \times 100$$

$$= \frac{14,00,000}{28\%}$$

$$= ₹\ 50,00,000$$

2. Profit on sales of ₹ 85,00,000

Total Contribution 85,00,000 *28/100	23,80,000
Less: Fixed cost	14,00,000
Profit	9,80,000

3. If Present selling price is reduced by 10%

Present selling price	₹100
Variable cost is (100 – 28)	₹ 72
New selling price (100 – 10)	₹ 90

New Contribution	₹ 18
New P/V ratio = $\frac{18}{90}\times 100$ =	20%
Profit in 2024:	
Contribution 60, 00,000 28 /100 =	16,80,000
Less: Fixed cost	14,00,000
Profit	2,80,000

Sales for desired profit of ₹ 2, 80,000 $= \frac{\text{Fixed cost+Desired profit}}{\text{New PV ratio}}$

$= \frac{14,00,000+2,80,000}{20\%}$

$= \frac{16,80,000}{20\%}$

= ₹ 84,00,000

Illustration 2 :

An exporter of clothing is earning a profit of ₹ 1,00,000 on a sale of ₹ 12,00,000.Selling price is ₹ 50 per cloth and variable cost is ₹ 40 per cloth. The exporter incurs an additional fixed cost of ₹3,00,000 on product improvement which also enable him to economies ₹5 in per cloth variable cost. As per trade agreement the sale of his clothes is restricted to the old value of ₹ 12,00,000. What should be the selling price per cloth so that the exporter earns the same profit at the same sales value?

Solution :

Selling price per cloth	₹ 50
Less: Variable cost per cloth	₹ 40
Contribution	₹10
P/V Ratio	$= \frac{\text{Contribution}}{\text{Sales}}\times 100$
	$= \frac{₹\ 10}{50}\times 100 = 20\%$
Total Contribution	= 12, 00,000 × 20% = ₹ 2,40,000
Contribution	= Fixed Cost + Profit
₹ 2, 40,000	= Fixed Cost + ₹ 1,00,000
Fixed cost	= ₹ 1,40,000

New Fixed cost = ₹ 1,40,000 + 3, 00,000 = ₹ 4,40,000

New Variable cost = ₹ 40 – 5 = ₹. 35

$$\text{New desired sales} = \frac{\text{New Fixed cost} + \text{New profit}}{1 - \text{New Variable Cost} / \text{New Sales}}$$

$$₹\ 12,00,000 = \frac{₹\ 4,40,000+1,00,000}{1-35/S}$$

12,00,000 (1-35/S = ₹ 5,40,000

S = ₹ 63.64

New Selling price = ₹ 63.64 per cloth

Illustration 3 :

Calculate the break-even for a bus journey between Hyderabad and Chennai, where the cost of a bus is ₹ 1,50,000 and the cost of each seat is ₹ 5,000. The capacity of the bus is 60 passengers, and each ticket for the journey is ₹ 400. There is no variable cost per passenger.

Solution :

1. Contribution per bus:

   Revenue per bus = Ticket Price × Seating Capacity = 400×60 = 24,000

   Contribution per bus = Revenue per bus − Cost of bus = 24,000 − 5,000 = 19,000

2. No. of buses to recover total fixed cost:

   To recover the cost of the bus:

   $$\text{No. of buses to recover fixed cost} = \frac{\text{Total fixed costs}}{\text{Contribution per bus}}$$

   The fixed cost of the bus is ₹ 1,50,000. Therefore:

   $$\text{No. of buses to recover fixed cost} = \frac{1,50,000}{19,000} = 8 \text{ buses}$$

   So, you would need 8 buses to cover the fixed cost.

3. Fixed cost with 8 buses:

   Fixed cost with 8 buses = Cost of bus+(Cost per seat × 8)

   = 1,50,000 + 5,000 × 8 = 1,50,000 + 40,000 = 1,90,000

4. Break-even number of passengers:

$$\text{Break-even passengers} = \frac{\text{Fixed cost with 8 buses}}{\text{Revenue per passenger}}$$

$$= \frac{1,90,000}{400}$$

$$= 475 \text{ passengers}$$

Thus, the company needs 475 passengers to break even

1. Revenue from 475 passengers:

Revenue from 475 passengers = 475 × 400 = 1,90,000

Illustration 4 :

From the following information, calculate the break – even point and turnover required to earn a profit of ₹ 50,000 :

Fixed overheads ₹ 2,00,000

Variable cost ₹ 5

Selling Price ₹ 35

If the company is earning a profit of ₹ 50,000, Express the 'margin of safety' available to it.

Solution :

1. Break – even point:

	₹
Selling price per unit	35
Variable cost per unit	5
Contribution per unit	30
Fixed Overheads	2,00,000

$$\text{Break – even point} = \frac{\text{Fixed overheads}}{\text{Contribution per unit}}$$

$$= \frac{2,00,000}{30} = 6,667 \text{units or sales of ₹ } 2,33,345$$

1. Turnover required to earn profit of ₹50,000

$$= \frac{\text{Fixed cost+Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{₹\ 2,00,000 + ₹\ 50,000}{30}$$

$$= \frac{2,50,000}{50} = 8,334 \text{ units or sales of } ₹2,91,690$$

2. Margin of Safety:

	Units	₹
Actual Sales	8,334	2,91,690
Sales at break –even point	6,667	2,33,345
Margin of Safety	1,667	58345

Margin of safety may also be calculated as follows:

$$\text{Margin of Safety} = \frac{\text{Net Profit}}{\text{PV ratio}}$$

$$= \frac{50,000}{85.71\%}$$

= ₹58,336

Illustration 5 :

Two firms A&Co. and B&Co. sell the same type of product in the same market. Their budgeted Profit &Loss Account for the year ending 31 March 2024 are as follows:

Particulars	₹	A&Co	₹	B&Co
Sales		5,00,000		6,00,000
Variable cost	4,00,000		4,00,000	
Fixed cost	30,000	4,30,000	70,000	4,70,000
		70,000		1,30,000

Required:

1. Calculate at which sales volume both the firms will earn equal profits.
2. State which firm is likely to earn greater profits in conditions of heavy demand?
3. Low demand for the product.

Solution :

1.	A&Co	B&Co
Sales	5, 00,000	6, 00,000
Less: Variable cost	4,00,000	4,00,000
Contribution	1,00,000	2,00,000
P/V ratio	$\frac{1,00,000}{5,00,000} \times 100$ = 20%	$\frac{2,00,000}{6,00,000} \times 100$ = 33.33%

Break – even sales:

$$\frac{30,000}{20\%} = ₹\ 1,50,000 \qquad \frac{70,000}{33033\%} = ₹\ 2,10,000$$

Sales volume (At which both the firm will earn equal profits)

$$= \frac{\text{Difference in Fixed Costs}}{\text{Difference in } \frac{p}{v} \text{ ration}}$$

$$= \frac{₹\ 70,000-30,000}{33.33\%-20\%} = ₹\ 3,00,000$$

2. In conditions of heavy demand for the product, the firm which is having higher P/V ratio is likely to earn more profits. The P/V ratio of B&Co. at 33.33% is higher than that of A&Co. at 20%. Therefore, B&Co is likely to earn more profits if the sales volume exceeds ₹ 3, 00,000.

3. In conditions of low demand for the product, the firm which breaks even earlier is likely to earn more profits. As the break –even point of A&Co at ₹1,50,000 is lower than that of B&Co at ₹2,10,000, Therefore, A&Co is likely to earn higher profits.

Illustration 6 :

The variable cost structure of a product manufactured by a company during the current year is as under:

	₹ per unit
Material	120
Labour	30
Overheads	12

The selling price per unit is ₹ 270 and the fixed cost and sales during the current year are ₹14,42,000 and ₹ 40,50,000respectively. During the forthcoming year, the direct workers will be entitled to a wage increase of 10% from the beginning of the year and the material cost, variable overheads and fixed overheads are expected to increase by 7.5%, 5%, and 3% respectively.

The following are required to be computed:

(i) New Sales Price in the forthcoming year, if the current P/V ratio is maintained.

(ii) Number of units that would require to be sold during the forthcoming year so as to Yield the same amount of profit in the current year assuming that selling price per unit will not be increased.

Solution :

$$\text{No. of units sold in current year} = ₹\ \frac{40,50,000}{270} = 15,000$$

Statement Showing Current Year Profit

		₹
Selling price per unit		270
Less: Variable cost per unit		
Material	120	
Labour	30	
Overheads	12	162
Contribution Per unit (S -V)		108
Total contribution (15,000 units × ₹ 108)		16, 20,000
Less: Fixed Costs		14, 00,000
Profit		2, 20,000

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{16,20,000}{40,50,000} \times 100 = 40\%$$

(a) New Sale Price in the Forthcoming Year if Current P/V Ratio is to be maintained

New Variable cost per unit	₹
Material - 120 + 7.5% X 120	129
Labour - 30 + 10% X 30	33.00
Variable - 12 + 5% x 12	12.60
	174.60
Selling price = $174.60 \times \frac{100}{60}$	291.00

(if the pv ratio is 40%, ratio of variable cost to sales 60%)

Contribution (291.00 – 174.60)	116.40

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{116.40}{291} \times 100 = 40\ \%\ \text{(The same as in current year)}$$

(b) Contribution of the number of units to be sold in forthcoming year to yield the same amount of profits in current year assuming that selling price per unit will not be increased.

Current Year's profit	2, 20,000
Fixed overhead	14,42,000
Desired contribution	16, 62,000

Contribution per unit ₹ 270 - ₹ 174.60 = ₹ 95.40 $= \frac{\text{DesiredContribution}}{\text{Contribution per unit}} = \frac{16,62,000}{95.40}$

= 17,422 units

Illustration 7 :

S. Ltd manufactures and markets a single product. The following information is available:

	₹ per unit
Materials	10.00
Conversion costs (variable)	5.00
Dealer's margin	3.00
Selling price	30.00

Fixed cost: ₹ 3, 50,000

Present sales: 60,000 units

Capacity utilization: 75%

There is significant competition. Extra efforts are necessary to sell. Two Suggestions have been made for increasing sales:

(1) by reducing sales price by 10% and

(2) by increasing dealer's margin by 25% over the existing rate.

Which of the two suggestions would you recommend if the company desires to maintain the present profit? Justify your recommendation.

Solution :

Calculation of present profit

	₹
Materials	10
Conversion costs (variable)	5
Dealer's margin (variable)	3
Total variable cost	18
Selling price	30
Contribution per unit	12
Total Contributions: (12 × 60,000)	7,20,000
Less: Fixed cost	3,50,000

Profit		3,70,000
Suggestion 1.	Increasing sales by reducing sales price by 5 %	₹
	Revised selling price (30 - 10%)	27
	Variable cost	18
	Contribution per unit	9

$$\text{Sales} = \frac{\text{Fixed cost+Desired profit}}{\text{Contribution per unit}} = \frac{3,50,000+30,70,000}{9} = \frac{7,20,000}{9} = 80,000 \text{ units}$$

Capacity Utilization:

Since current sales are at 75% capacity utilization, the capacity at 100% would be:

$$\frac{60,000}{75\%} = 80,000 \text{ units}$$

Thus, to maintain the current profit with the reduced selling price, the company needs to sell 80,000 units at full capacity.

Suggestion 2. Increasing sales by increasing dealer's margin by 25%	₹
Materials	10
Conversion cost	5
Dealer's margin (2+25%)	3.75
Variable cost	18.75
Selling price	30.00
Contribution per unit	₹ 11.25

$$\text{Sales} = \frac{\text{Fixed cost+Desired profit}}{\text{contribution per unit}} = \frac{3,50,000+3,70,000}{12.25}$$

$$= \frac{7,20,000}{11.25} = 64,000 \text{ units}$$

Capacity Utilization: Since the present sales of 60,000 units represent 75% capacity utilization, the capacity at 100% is:

$$\frac{60,000}{75\%} = 80,000 \text{ units}$$

Thus, to maintain the current profit with the increased distributor's margin, the company needs to sell 64,000 units, which is within the available full capacity.

Recommended Suggestion: Suggestion 2 as it involves a small increase in sales volume and keep the sales within the company's full capacity of 80,000 units

Illustration 8 :

A retailer dealer in garments is currently selling 24,000 shirts annually. He supplies the following details for the year ended 31 dec, 2021:

	₹
Selling price per unit	40
Variable cost per unit	25
Fixed cost: Staff salaries for the year	1, 20,000
General office costs for the year	80,000
Advertising costs for the year	40,000

As a cost accountant of the firm you are required to answer the following each part independently:

1. Calculate the break-even point and margin of safety in sales revenue and number of shirts sold.
2. Assume that 20,000 shirts were sold in a year. Find out the net profit of the firm.
3. If it is decided to introduce selling commission of ₹ 3 per shirt, how many shirts would require to be sold in a year to earn a net income of ₹ 15,000.
4. Assuming that for the year 2022 an additional staff salary of ₹ 34,000 is anticipated, and price of shirt is likely to be increased by 15%,what should be the break-even point in number of shirts and sales revenue?

Solution :

1. BEP $= \frac{\text{Fixed cost}}{\text{contribution per unit}} = \frac{2,40,000}{15}$ = 16,000 units or

= 16,000×40 = ₹ 6,40,000

Margin of Safety (MS) = Actual sales – Break even sales

= 24000×40 - ₹6, 40,000

= 9, 60,000 - 6,40,000 = ₹ 3,20,000

2. Net Profit when 20,000 shirts are sold:

Contribution: 20,000 × 15	₹ 3,00,000
Less: Fixed Costs	₹ 2,40,000
Profit	₹ 60,000

3. Sales for Desired Profit. $= \frac{\text{Fixed cost+Desired profit}}{\text{contribution per unit}} = \frac{2,40,000+15,000}{15-3}$

$= \frac{2,55,000}{12}$ = 21,250 shirt

4. New Break-even Point: (In units) $= \frac{\text{New Fixed Cost}}{\text{New contribution per unit}} = \frac{2,40,000+34,000}{46-18}$

= 2, 74,000/18 = 15,222 shirts

In ₹ = 15,222 × 46 = ₹ 7,00,212

Illustration 9 :

A company producing a single product sells it at ₹ 50 per unit. Unit variable cost is ₹35 and fixed cost amounts to ₹12 lakh per annum. With this data you are required to calculate the following, treating each independent of the other:

1. P/V ratio and break – even sales.
2. New Break-even sales if variable cost increases by ₹ 3 per unit, without increase in selling price.
3. Increase in sales required if profits are to be increased by ₹ 2.4 lakh
4. Percentage increase /decrease in sales volume units to off – set
   (a) An increase of ₹ 3 in the variable cost per unit.
   (b) A 10% increase in selling price without affecting existing profits quantum.
   (c) Quantum of advertisement expenditure permissible to increase sales by ₹ 1.3 lakh, without affecting existing profits quantum.

Solution :

1. Contribution = Selling price – Variable cost = 50-35 = ₹ 15 per unit

$$\text{P/V Ratio} = \frac{\text{contribution}}{\text{Sales}} \times 100 = \frac{15}{50} \times 100 = 30\%$$

$$\text{Break – even sales} = \frac{\text{Fixed Cost}}{\text{P/Vratio}} = \frac{₹\ 12\ \text{lakhs}}{30\%} = ₹\ 40\ \text{lakhs}$$

Or ₹ 40 lakhs / ₹ 50 = 80,000 units

2. Revised Contribution = Selling price – Revised Variable cost = 50 – 38 = 12 per unit

$$\text{P/V Ratio} = \frac{\text{contribution}}{\text{Sales}} \times 100 = \frac{12}{50} \times 100 = 24\%$$

$$\text{New Break – even sales} = \frac{\text{Fixed Cost}}{\text{P/Vratio}} = \frac{₹\ 123{,}00{,}000}{24\%} = ₹50\ \text{lakh}$$

Or ₹ 50 lakh / ₹ 50 = 1, 00,000 units

3. $\text{Increase in sales} = \frac{\text{Profit}}{\text{P/Vratio}} = \frac{₹\ 2.4\ \text{lakh}}{30\%} = ₹\ 8\ \text{lakh}$

   Thus, Increase in sales amounting to ₹ 8 lakh will be required to increase the profit by ₹ 2.4 lakh.

4. (a) At variable cost of ₹ 35 per unit, BEP sales are ₹ 40 lakh .At variable cost of ₹ 38 per unit, BEP sales are ₹ 50 lakh.

   Thus, for an increase of ₹ 3 in the variable cost per unit, increase of sales by ₹ 10 lakh is required. The percentage increase will be

$$\frac{10}{40} \times 100 = 25\%$$

Thus 25 per cent increase in sales volume is required to off – set an increase of ₹3 in the variable cost per unit.

(b)Revised contribution = Revised selling price – Variable cost

= 55 – 35 = ₹ 20 per units

The units will be decreased by 20,000.The percentage decrease will be :

$$= \frac{20,000}{80,000} \times 100 = 25\%$$

(c)When sales are increased by ₹ 1.30 lakh then Sales × P/V ratio will be contribution. Thus 30% of ₹ 1.30 lakh = ₹39, 000 will be additional contribution. Hence, ₹ 39,000 can be spent on advertisement without affecting existing amount of profit.

Illustration 10 :

If Margin of safety is 40% of sales, find fixed costs when profit is ₹ 20,000.

Solution :

Margin of safety = 40% of sales

Break – even sales = 60% of sales

Margin of safety $= \frac{\text{Profit}}{\text{P/Vratio}}$

Break –Even sales $= \frac{\text{Fixed Cost}}{\text{P/Vratio}}$

$$\frac{40\%}{60\%} = \frac{\text{Profit}}{\text{P/Vratio}} \div \frac{\text{Fixed Cost}}{\text{P/Vratio}}$$

$$\frac{40\%}{60\%} = \frac{\text{Profit}}{\text{Fixed Cost}}$$

$$\frac{2}{3} = \frac{20,000}{\text{Fixed Cost}}$$

Fixed cost $= \frac{20,000 \times 3}{2}$

= ₹30,000

3 Applications of Marginal Costing in Short Term Decision Making [Study Material - Module 4]

Illustration 1 :

XY Co. Ltd is producing 40,000 units of component X at an average cost of ₹80 per unit including semi-variable cost of ₹25 per unit. 50% of semi – variable costs are variable and the rest are fixed .Component X can be purchased from an outside supplier at a price of ₹75 per unit .If, so done, the vacated capacity can be used for producing 12,000 units of product Y at a variable cost of ₹30 per unit and an additional fixed cost of ₹1, 20,000. Product Y can be sold at ₹70 per unit.

Should the company continue producing X or buy X from outside and produce Y instead.

Solution :

When component X is produced by the company.

As the fixed cost remains the same under the two alternatives the relevant costs are marginal (variable) cost if the component is produced by the company and the price offered by the outside supplier

	₹
Variable cost per unit	55
Add: Variable portion of semi variable cost (50% of 25)	12.5
Total variable cost per unit	67.5
Price offered by outside supplier	75
Saving in cost per unit (if manufactured) (75-67.5) =	7.5
Total savings in cost = 40,000 units × ₹7.5	3,00,000

When component X is purchased from outside and released capacity is used to produce Y.

	₹
Selling price per unit	70
Less: variable cost per unit	30
Contribution per unit	40
Total Contribution = 12,000units × ₹ 40	4,80,000
Less: Additional fixed cost	1, 20,000
Profit	3,60,000

Conclusion: ABC Ltd. should buy Component A from the outside supplier and use the vacated capacity to produce Product Z, as it results in a higher profit of ₹3,60,000 compared to saving ₹3,00,000 by continuing to produce Component A.

Illustration 2 :

A furniture manufacturer makes an average profit of ₹4.00 per unit on a selling price of ₹22.50 by producing and selling 50,000 units at a 50% of potential capacity.

The cost of sales per unit is as follows:

Direct Materials	₹6.00
Direct wages	₹2.00
Factory overheads	₹ 8.00 (60%variable)
Sales overheads	₹ 1.00 (30% variable)

During the current year, the manufacturer plans to produce the same quantity but estimates that his fixed costs would go up by 12% while the rates of direct wages and direct materials will rise by 10% and 5% respectively. However, the selling price cannot be changed.

Meanwhile, the manufacturer receives an offer for an additional 25% of potential capacity.

What minimum price would you recommend for acceptance of the offer to ensure the manufacturer an overall profit of ₹3,10,000?

Solution :

Statement of Marginal Cost and Contribution for Current Year

Direct material (₹ 6.00 + 5% of ₹ 6.00)	= ₹ 6.30
Direct wages (₹2.00 + 10% of ₹ 2.00)	= ₹ 2.20
Variable overheads:	
Factory overheads (60% variable)	4.80
Sales overheads (30% variable)	0.30
Total marginal cost	₹ 13.60
Contribution per unit	₹ 8.90
Selling price	₹ 22.50

Statement of Profit on Sale of 50,000 Units		
Sales (50,000 × ₹ 22.50)		11,25,000
Less: Variable cost (50,000 × ₹13.60)		6,80,000
Contribution		4,45,000
Less: Fixed costs:		
Factory (50,000 × 3.20 + 12% of 1,60,000)	1,79,200	
Sales (50,000 × 0.70 + 12% of 35,000)	39,200	2,18,400
Profit		2,26,600

Desired Profit	₹ 3,10,000
Less: Profit on 50,000 units	2,26,600
Profit to be earned on 20,000 units	₹ 83,400

Statement of Minimum Selling Price for 12,500 Units:

	₹
Variable cost (12,500 units × ₹ 13.60)	1,70,000
Desired profit	83,400
Total sales	2,53,400
Selling price per unit	₹ 20.27

Illustration 3 :

A factory with an old production line is considering purchasing a new and more efficient plant that offer better production capacity and lower maintenance costs . Below are the details of the existing and proposed new plants:

	For existing plant	For proposed new plant
Cost	80,000	2,00,000
Total estimated life (The plant is 3 years old)	8 years	15 years
Scrap value at close of estimated life	25,000	40,000
Maintenance	3,500	4,500
Cost of power	6,000	8,500
Repairs (at average cost for remaining period of useful life)	4,000	2,500
Wages (including fringe benefits)	4,000	6,000
Running hours (possible)	1,500 hrs	2,000 hrs
Output per hour	120 units	250 units

The cost of installation of the new plant will be ₹25,000.

The offer of the new plant includes provisions for the vendors taking over the old plant at a cost of ₹40,000.The straight line method of depreciation is used by management for costing purposes. The existing machine is worked only for 1,500 hours per annum due to time lost on break-down etc.

Prepare statement of comparative cost to enable the management to take a decision on the proposal.

Solution :

Statement of Comparative Cost

Estimated output and sale (units)	₹ 1, 80,000	2,00,000
Operating costs (estimated)	₹	₹
Maintenance	3,500	4,500
Cost of power	6,000	8,500
Repairs	4,000	2,500
Wages	4,000	6,000
Interest on average capital outlay @ 10%	-	9,250
Depreciation: $\frac{₹80,000 - ₹25,000}{8}$	6875	
$\frac{₹2,00,000 - ₹40,000}{15}$		10,666.67
Estimated total cost	24,375	41,416.67
Average cost of operation per unit of output and sale	0.135	0.207

Working Note: 1, Average capital outlay on the new plant is estimated as follows:

The new plant will be capable of producing up to 5,00,000 units, which requires 2,000 hrs of operation per year at 250 units per hour.

	₹
Cost of plant	2,00,000
Cost of installation	25,000
Total capital cost	2, 25,000
Less: Value of old plant adjusted	40,000
Net capital outlay	1, 85,000
Average capital	= 1/2of 1, 85,000
	= ₹ 92,500

Illustration 4 :

When XY Ltd operates at normal capacity , it produces 25,000 units of a product from Plant. The unit cost of manufacturing at normal capacity is as follows:

	₹
Direct materials	7.00
Direct labour	3.50
Variable overheads	4.00
Fixed overheads	5.00
	19.50

Each unit of product is sold for ₹25 with variable selling and administrative expenses of ₹0.80 per unit of product.

The company expects that during the next year only 3,000 units can be sold. Management plans to shut–down the plant, estimating that the fixed manufacturing overheads can be reduced to ₹50,000 for the next year. When the plant is operating, the fixed overhead costs are incurred at uniform rate throughout the year. Additional costs of plant shut are estimated at ₹12,000.

Should the plant be shut-down? Show computations. What is the shut-down point?

Solution :

	₹
Irreducible fixed costs	50,000
Additional shut-down costs	12,000
Total shut-down costs	62,000

If the company continues to operate; it will incur ₹1,25,000 as fixed costs. But if it closes down, the shut-down cost will amount to ₹62,000. The plant should continue to operate if the contribution from product sales is equal to or greater than ₹ 63,000 difference in cost. However if the difference of cost (₹1,25,000 - ₹62,000) cannot be recovered, the plant should be closed down.

In the case of the above-mentioned plant, the position is as follows:

	₹
Sales (3,000 units @ ₹25)	75,000
Less: Variable costs (3000@ ₹15.30)	45,900
Contribution	29,100
Less: Fixed costs	1,25,000
Operating loss	(95,900)

From the above calculation, it is clear that if the company continues to operate the plant loss is ₹95,900; but if the plant is closed down, shut-down costs are ₹62,000. Hence, it is preferable to close down the plant.

Shut-down point will be calculated as follows:

$$= \frac{\text{Fixed cost–Shutdown costs}}{\text{contribution per unit}} \times \text{S.P.} \qquad = \frac{1,25,000–62,000}{25–15.30} \times 25$$

$$= \frac{63,000}{9.7} \times 25 \qquad = ₹1,62,371 \text{ or } 6495 \text{ units}$$

Illustration 5 :

A producer installed a machine which can produce product 'A' as well as product 'B'. Annual maximum machine running capacity is 4,000 hours. Cost details about the products are as follows:

	Product 'A'	Product 'B'
Selling price per unit	₹ 50	₹ 20
Variable cost per unit	₹ 30	₹ 12
Machine hours required per unit of product	10 hrs.	2 Hrs.
Annual demand	300 Units	1,600 Units

Annual fixed Cost: ₹10,000

Calculate optimum product-mix showing annual contribution and profit. Give necessary explanation. Also show that a product-mix other than that suggested by you will affect the profits.

Solution :

Maximum machine capacity 4,000 hours

Annual fixed Cost ₹10,000

Statement of Contribution per Machine Hour

	Product A	Product B
Annual demand	300 unit's	1600 units
Selling price per unit	₹ 50	₹ 20
Less: Variable cost per unit	30	12
Contribution per unit	₹ 20	₹ 8
Machine hours per unit	10 hrs	2 hrs
Contribution per machine hour	₹ 2	₹ 4
Ranking	2	1

As Product B provides maximum contribution per machine hour, the available machine capacity should first be utilized to produce 1,600 units of B. It will take 3,200 i.e. 1600 × 2 machine hours. The remaining hours i.e. 4,000 - 3,200 = 800 hours can be used to produce 80 units of Product A. Hence, the optimum product mix is 1,600 units of B and 80 units of A.

Statement Showing Profit from Optimum Product Mix

	₹
Contribution of Product B - 1,600 × 8	12,800
Contribution of Product A - 80 × 20	1,600
Total contribution	14,400
Less: Fixed Cost	10,000
Profit	4,400

Any other mix with constraint of 4,000 machine hours will yield lesser profit. Suppose an alternative mix is 200 units of A and 1,000 units of B. The resulting profit will be:

Contribution from B- 1000 × 8	8,000
Contribution from A - 200 × 20	4,000
Total contribution	12,000
Less: Fixed Cost	10,000
Profit	₹ 2,000

Illustration 6 :

J Ltd. produces and sells three products A, B and C. It has an available machine hour capacity of one lakh hours interchangeable among the three products. Presently the company produces and sells:

18,000 units of A

12,000 units each of B and

15,000 units of C.

The selling prices per unit of A, B and C are ₹30, ₹40 and ₹50 respectively. With this price structure and current sales mix, the company is incurring a loss. The total expenditure, excluding fixed cost. is ₹15 lakhs. The unit cost ratio among the products A, B and C are 5:8:10. Fixed cost per unit is ₹6

Since the company desires to improve its profitability without changing its cost and price structure.

Considering the following three mixes so as to be within the total available capacity:

	A	B	C
Mix I	18,000	14,000	16,000
Mix II	22,000	12,000	12,000
Mix III	25,000	10,000	15,000

Calculate the loss from the present mix and profit or loss from each of the proposed mix. Advise the Management which mix should be accepted.

Solution :

Calculation of Variable Cost per Unit

Product	Units produced	Unit cost ratio	Equivalent
A	18,000	5	90,000
B	12,000	8	96,000
C	15,000	10	1, 50,000
Total	45,000		3,36,000

Total Variable cost ₹15,00,000

Variable cost per equivalent unit $= \frac{15,00,000}{3,36,000} =$ ₹4.46

Variable cost of A - 5 × 4.46 = ₹ 22.30 per unit

B - 8 × 4.46 = ₹ 35.68 per unit

C - 10 × 4.46 = ₹ 44.60 per unit

Contribution per unit A = 30 - 22.30 = ₹ 7.70

B = 40 – 35.68 = ₹ 4.32

C = 50 - 44.60 = ₹ 5.40

Total Contribution A - 18,000 units × ₹ 7.70 = 1, 38,600

B - 12,000 units × ₹ 4.32 = 51,840

C - 15,000 units × ₹ 5.40 = 81,000

Total Contribution = 2, 71,440

Less: Fixed cost @ ₹ 6 for 45,000 units = 2, 70,000

Profit = 1440

Statement of Comparative Profitability

Particulars	I	II	III
X (Units)	18,000	22,000	25,000
Y (Units)	14,000	12,000	10,000
Z (Units)	16,000	12,000	15,000
Contribution			
A - @ ₹ 7.70 p.u.	1,38,600	1,69,400	1,92,500
B- @ ₹ 4.32 p.u.	60,480	51,840	43,200
C- @ ₹ 5.40 p.u.	86,400	64,800	81,000
Total	2,85,480	2,86,040	3,16,700
Less: Fixed Cost	2,70,000	2,70,000	2,70,000
Profit/ Loss	15,480	16,040	46,700

Advice: Mix III is the most profitable option with a profit of ₹46,700. Therefore, Mix III should be accepted by management to improve profitability.

Illustration 7:

Arya Ltd is considering launching a new product in the market. The estimated cost details are as follows:

1. Material cost per unit : ₹40
2. Labour cost per unit : ₹36
3. Production overheads are to be calculated from following data:

Production departments	Hourly Overhead rate (₹)	Normal monthly output for Overhead rate(₹)	Fixed overheads included in overhead (₹)	Time to be taken by new product
A	3.60	30,000	36,000	5
B	4.80	20,000	12,000	2.5
C	6.00	40,000	60,000	4

1. Annual administration and selling expenses- ₹ 2.50,000 (applicable to the new product).
2. Estimated sales quantity: 50,000 per annum.

Based on the above information, prepare a cost-sheet and find out the unit selling price with a profit margin of 40% on total cost.

Additionally, an overseas customer has offered to buy an extra 10,000 units of the new product at ₹125 per unit. Should the management accept this offer? Provide recommendations based on your calculations.

Solution :

Computation of Departmental Overhead Rates

	A (₹)	B (₹)	C (₹)
Solution :	1,08,000	96,000	2,40,000
Fixed overhead	36,000	12,000	60,000
Variable overheads:	72,000	84,000	1,80,000
Variable overhead rate	2.40	4.20	4.50
Fixed overhead rate	1.20	0.6	1.50

"Note: Normal monthly output has been presumed to be in hours

Computation of Selling Price per Unit

		₹ per unit	₹
Direct material		40.00	
Direct labour		36.00	76.00
Variable Overhead:			
Department	A ₹ 2.40 × 5 H	₹ 12.00	
	B ₹ 4.20 × 2.5 H	₹10.50	
	C ₹ 4.50 × 4 H	₹ 18.00	40.50
Marginal cost of production			116.50
Fixed overheads:			
Department	A ₹ 2.40 × 5 H	₹6.00	
	B ₹ 4.20 × 2.5 H	₹1.50	
	C ₹ 4.50 × 4 H	₹6.00	13.50
Total cost of production			130.00
Administrative and selling overhead (₹2, 50,000/50,000 pcs.)			5.00
Total cost of sales			135.00
Add 40% Mark-up on cost of sales			54.00
Suggested Selling Price			189.00

Recommendation:

The management should accept the overseas customer's offer, as it would result in a profit of ₹85,000.

Illustration 8 :

A manufacturing company is considering purchasing one of the following machines for its production. The machine details are as follows:

Type	variable cost per unit	Total fixed cost
Manual-operated	15	5,000
Semi-automated	10	12,000
Fully automated	4	30,000

Determine the production volume at which the company should choose each machine type based on the total cost per unit.

Solution :

It is clear from the above data that at very low levels of production, the manual-operated machine will be the cheapest. However, the point at which semi-automated machine becomes cheaper can be found out by comparing the increase in fixed costs with reduction in variable costs. Thus,

$$\text{No. of units} = \frac{\text{Increasing in fixed cost}}{\text{Decreasing in variable cost}}$$

$$\text{No. of units} = ₹\ \frac{7,000}{5} = 1,400$$

So if the production is more than 1,400 units, it would not be worth using the manual-operated machine.

The change-over from semi-automated to fully automated can be found out in similar manner.

$$\text{No. of units} = \frac{\text{Increasing in fixed cost}}{\text{Decreasing in variable cost}}$$

$$\text{No. of units} = ₹\ \frac{18,000}{6} = 3,000$$

If units produced from 0 to 1,400 use manual-operated, 1,400 to 3,000 use semi-automatic, and above 3,000 uses fully automatic.

Verification:

$$1,400 \times ₹\ 15 + ₹\ 5,000 = \frac{26,000}{1,400} = ₹\ 18.57 \text{ per unit}$$

$$3,000 \times ₹10 + ₹\ 12,000 = \frac{42,000}{3,000} = ₹\ 14.00 \text{ per unit}$$

$$4,000 \times ₹\ 4 + ₹\ 30,000 = \frac{46,000}{4,000} = ₹\ 11.5 \text{ per unit}$$

Illustration 9 :

Copper India Ltd. is producing three products X, Y and Z. The data for the three products is given below:

Particulars	X	Y	Z.
Maximum capacity	5000 units	2000 units	3000 units
Direct material @ ₹10 per kg	₹ 40	₹ 10	₹ 30
Other variable costs	₹ 36	₹ 25	₹ 10
Selling price	₹ 100	₹. 50	₹ 60
Fixed Cost (unavoidable)	₹ 20,000	₹ 15,000	₹ 10,000

Calculate the best product-mix in each of the following independent cases:

(i) Total availability of raw material is limited to 18,000 kg.

(ii) Under a trade agreement the firm cannot produce more than 7,500 units of the three products taken together.

(iii) The total sales value of X, Y and Z cannot exceed ₹ 6,50,000.

Solution :

Statement of Contribution

Particulars	X	Y	Z.
Maximum capacity	5000 units	2000 units	3000 units
Fixed Cost (unavoidable)	₹ 20,000	₹15,000	₹ 10,000
Selling price per unit	₹ 100	₹ 50	₹ 60
Direct material @ Other variable exp.	40	10	30
other variable exp.	36	25	10
Total variable cost	-76	-35	-40
Contribution per unit	24	15	20
Material (Kg.) per unit of product	40/10 = 4 kg	40/10 = 4 kg	30-10 = 3 kg
Contribution per kg. of material	24/4 = ₹ 6	15/4 = ₹ 3.75	20/3 = ₹ 6.67
P/V ratio =	24/100 = 0.24	15/50 = 0.30	20/60 = 0.33

(a) Total availability of material is limited to 18000 kg

First produce 2000 units of Y using 1 × 2000	2000 kg
Next produce 3000 units of Z using 3 × 3000	9000 kg.
Next produce 1,750 units of X using 4 × 1750	7000 kg
	18000 kg

Optimum mix is 1750 units of X + 2000 units of Y + 3000 units of Z

Total contribution from optimum mix (1750×24+2000×15+3999×20)	₹ 132000
Less: Total fixed cost (₹ 20,000 + 15,000 + 10,000)	₹ 45,000
Profit	₹ 87,000

(b) Total output and sales of X, Y and Z limited to 7,500 units

First produce 5000 units of X

Next produce 2,500 units of Z

Optimum product mix is 5000 units of X and 2500 units of Z

Total contribution from optimum mix (5000 × ₹24 + 2500 × ₹20)	= ₹1, 70,000
Less: Total fixed cost (₹20,000 + ₹15,000 + ₹10,000)	= ₹ 45,000
Profit	₹ 1,25,000

(iii Total sales value of X, Y and Z cannot exceed ₹ 6, 50,000

First produce 3000 units of Z	₹ 1,80,000
Next produce 2,000 units of Y	₹ 1,00,000
Next produce 3700 units of X	₹ 3,70,000
	₹ 6,50,000

Optimum mix is 3700 units of X + 2000 units of Y + 3000 units of Z

Total contribution from optimum mix (3700×24+2000×15+15,000+10,000)	₹ 1, 78,800
Less: Total fixed cost (₹ 20,000 + 15,000 + 10,000)	₹ 45,000
	₹ 1,33,800

Illustration 10 :

SGN , a company manufacturing a consumer product and marketing that through its network of 400 depots all over the country, is considering a proposal of closing down the depots and resorting to dealership arrangement. The total turnover of the company is ₹200 crores per annum. The average turnover, costs, etc. in respect of a depot are given below:

	₹
Annual turnover	50 lakhs
Average inventory	5 lakhs
Administrative expenses	50,000 per annum
Staff salary	80,000 per annum

The inventory carrying cost is 16% per annum which is the interest rate for working capital finance.

Marketing through dealers would require engaging dealers for each area. The dealers will assure a minimum sale for each area. This would result in increasing the capacity-utilization from 75% as at present to 90%. At present, the company's P/V ratio is 10% and break-even point is 15% of the capacity. The current profit is ₹150 lakhs.

Marketing through dealers would involve payment of a commission of 5% on sales. But 50% of the existing staff in the depots will have to be absorbed in the company. The dealers will deposit ₹5 crores with the company on which interest @ 12% per annum will be paid.

You are required to work out the net profit of the company, if this proposal is accepted. Also compute the net profit, if the commission to dealers is reduced to 4% on sales.

Solution :

Statement of Comparative Profitability

Particulars	75% capacity, utilization	90% capacity utilization (marketing through dealers)	
		at 5% commission on sales	At 4% commission on sales
Sales	200.00	240.00	240.00
Variable costs (90%)	180.00	216.00	216.00
Commission on sales	-	12.00	9.60
Contribution (A)	20.00	12.00	14.40
Less: Fixed costs:			
Adm. expenses (400 Depots	2.00	-	-
Staff salary (400 Depots)	3.20	1.60	1.60
Inventory carrying costs (5,00,000 × 400 × 0.16)	3.20	-	-
Other fixed costs (balancing figure)	10.10	10.10	10.10
Fixed cost	18.50	11.70	11.70
Profit (A - B)	1.50	0.30	2.70
Add: Savings on account of dealer's deposit 5,00,00,000 × (16% - 126)	-	0.20	0.20
Net profit	1.50	0.50	2.90

Comments: The proposal of closing down the depots and resorting to dealership arrangement is recommended only when commission to dealers is reduced from 5% of sales to 4% of sales because such a move will increase the profit from the present level of ₹ 1.50 crore to ₹ 2.70 crore.

N.B.

(i) The interest rate for working capital finance is 16% p.a. whereas the company shall pay interest dealers deposits @ 12% p.a. resulting in net saving of 4% p.a. or 0.20 crore.

(ii) P/V ratio = 10% (given). Ratio of variable cost to sale is 90%.

4 Transfer Pricing [Study Material - Module 5]

Illustration 1 :

A company has two divisions, P and Q. The division P is currently operating at full capacity. It has been asked to supply its product to division Q. Division P sells its products to its regular customers for ₹40 each. Division Q (currently operating at 60% capacity) is willing to pay ₹25 each for the component produced by division P (this represents the full absorption cost per component at division P). The components will be used by division Q in supplementing its main product to conform to the need of special order. As per the contract terms of sales, the buyer calls for reimbursement of full cost to division Q ,plus a 10% profit margin. Division P has a variable cost of ₹22 per component. The cost per unit of division Q subsequent to the buying part from Division P is estimated as follows :

Purchased parts - outside vendors	₹ 100
Purchased part - Division P	₹ 25
Other variable costs	₹ 60
Fixed overheads and administration	₹ 50
	₹ 235

The Company uses return on investment in the measurement of division and the division manager's performance.

Required:

(a) As manager of Division P, would you recommend selling your output to Division Q at the stipulated price of ₹ 25?

(b) Would it be in the overall interest of the company for Division P to sell its output to Division Q.

(c) Suggest an alternative transfer price and explain how could it lead to goal congruence?

Solution :

(a) As manager of Division P, the sales of ₹ 25 per unit to Division Q should not be recommended. Since Division P is already operating at its full capacity and all of its output is presumably absorbed by external customer at ₹ 40 per unit. The internal transfer made to Division Q, hence, would reduce its profits (by ₹ 15 per unit) as well as the ROI.

(b) Decision analysis (whether to transfer part from Division P to Division Q at ₹ 25 per unit or not)

Particular	Sold	Transferred to Division Q
Sale price (Division P)	40.00	25.00
Sale price (Division Q) (₹ 235 + 10%)		258.50
Less: Relevant incremental cost :		
For part of Division P	22.00	22.00
Purchased parts from outside	-	100.00
Other valuable cost	-	60.00
Profit per unit	18.00	53.00

Conclusion: It would be in the overall interest of the company for Division P to sell to Division Q at ₹ 25 per unit because the transfer would increase the company's profit by ₹35 per unit (₹53 profit from internal sale minus ₹18 from external sale)

(c) Dual price basis of effecting transfer is the most appropriate. In this case, the relevant transfer price will be `40 (sale) so far as Division P is concerned and `25 (purchase) so far as Division B is concerned. It will keep the profits of Division A unaffected and will facilitate the utilization of idle capacity of Division B and also increase its profit.

Illustration 2 :

AB Ltd. has two divisions Division X and Division Y. Division X produces product A, which it sells to external market and also to Division Y. Divisions in the AB Ltd are treated as profit centre and divisions are given autonomy to set transfer prices and to choose their supplier. Performance of each division measured on the basis of target profit given for each period.

Division X can produce 1,00,000 units of product A at full capacity. Demand for product A in the external market is for 70,000 units only at selling price of ₹2,500 per unit. To produce product A Division X incurs ₹1,600 as variable cost per unit and total fixed overhead of ₹4,00,00,000. Division X has employed ₹15,00,00,000 as working capital; working capital is financed by cash credit facility provided by its lender bank @ 11.5% p.a. Division X has been given a profit target of ₹ 2,50,00,000 for the year.

Division Y has found two other suppliers M Ltd and N Ltd. who are agreed to supply product A.

Division Y has requested a quotation for 40,000 units of product A from Division X.

Required:

1. Calculate the transfer price per unit of product A that Division X should quote in order to meet target profit for the year.
2. Calculate the two prices Division X would have to quote to Division Y, if it became AB Ltd. policy to quote transfer price based on opportunity costs.

Solution :

(i) Transfer price per unit of product A that Division X should quote in order to meet target profit for the year:

Quotation for the 40,000 units of product A should be such that meet Division

X's target profit and interest cost on working capital. Therefore the minimum quote for product A will be calculated as follows:

Particulars	**Amount (₹)**
Target Profit (given for the year) Add: Interest Cost on Working Capital (12, 00, 00,000 @11.5%)	2,50,00,000 1,38,00,000
Required Profit Add: Fixed Overhead	3,88,00,000 4,00,00,000
Target Contribution Less: Contribution Earned from external sales {60,000 units × ₹(2,500–1,600)}	7,88,00,000 5,40,00,000
Contribution Required from internal sales	2,48,00,000
Contribution per unit of Product A (₹2,48,00,000 ÷ 40,000 units)	₹ 620
Transfer Price of Product A to Division Y (Variable Cost per unit + Contribution per unit)	₹ 2,220

(ii) The two transfer prices based on opportunity costs For the 30,000 units (i.e. maximum capacity – maximum external market demand) at variable cost of production i.e. ₹1, 600 per unit.

For the next 10,000 units (i.e. external market demand – maximum possible sale) at market selling price i.e. ₹2,500 per unit.

Illustration 3 :

Hero Cycles has two divisions M and N which manufacture expensive bicycles. Division M produces the bicycle frame, and Division N assembles the rest of the bicycle onto the frame. There is a market for both the sub-assembly and the final product. The following data are available for each division:

Selling price for final product		₹ 3,000
Ong run average selling price for intermediate product		₹ 2,000
Incremental costs for completion in Division N		₹1,500
Incremental costs in Division M		₹ 1,200
The manager of Division N has made the following calculation		
Selling price for final product		₹ 3,000
Transferred in costs (market)	₹ 2,000	
Incremental costs for completion	₹ 1,500	₹ 3,500
Contribution (loss) on product.		₹ (500)

Required:

1. Should transfers be made to division N if there is no unused capacity in Division A? Is the market price the correct transfer price?
2. Assume that Division M's maximum capacity for this product is 1,000 units per month, and sales to the Intermediate market is now 800 units. Should 200 units be transferred to Division N? At what transfer price? Assume that for a variety of reasons, Division M will maintain the ₹2,000 selling price indefinitely. That is Division M is not considering about lowering the price to outsiders even if idle capacity exists.
3. Suppose Division M quoted a transfer price of ₹1,500 for up to 200 units. What would be the contribution to company as a whole if a transfer were made? As a manager of Division N, would you be inclined to buy at ₹1,500? Explain.
4. Suppose the manager of Division M has the option of (a) cutting the external price to ₹1,950 with the certainty that sales will rise to 1,000 units, or (b) maintaining the outside price of ₹2,000 for the 800 units and transferring 200 units of Division N at a price that would produce the same as in (a) operating income for Division M. What transfer price would produce the same operating income for Division M?

Solution :

(i) Statement of Profit (with transfer)

Dept. M	₹	Dept. N	₹	Co.	₹
Revenue	2000	Revenue	3000		
-Cost	1200	Transfer Cost	2000	M	800
		N's Cost	1500	N	(500)
	800		(500)		300

Statement of profit (If "M" does not transfer to "N")

External Sale	M	N	₹
Less Cost	2000	X	M 800
Benefit	1200	X	N -
	800	X	800

Its better to produce bicycle frame in dept. M & sold in external market instead of transfer to Division N.

(ii) A department has spare capacity 200 units & these 200 units can be produced and transfer to department N at minimum price (1200) it is variable Cost

Statement of Transfer Prices (200 units)

	Relevant Cost (₹)
Cost to be incurred	1200
+ Contribution to be lost	-
Minimum Transfer Price	1200

Maximum Transfer Price would be equal to incremental profit for N.

3000 – 1500 = 1500

Selling Price – Own Cost

Transfer Price for 200 units	Transfer price
0-200 Unit	1200 – 1500 per unit.

(iii)Statement of Cobntribution

	M		**N**		**Co.**
	₹		₹		₹
External sale	800 × 2000	Sale	200 × 3000		
Transfer price	200 × 1500	Less Cost		M	7,00,000
Cost	1000 × 1200	Transfer	200 × 1500	N	-
		Own Cost	200 × 1500		
Contribution	7,00,000		---		

Overall contribution to the Co. would be 7, 00,000 due to transfer Management of division N would not be interested to receive 200 (units) at ₹1500.

(iv)

Selling Price (₹)	Quantity
2000 Per unit	800
1950 per unit	1000
Quantity	Price
Sale 800	2000
200	?

Let X be the transfer price for 200 units.

Operating income from N1 = Operating income from N2.

1950 × 1000 - 1200 × 1000 = 800 × 2000 + 200 × X -1000 × 1200

X = 1750 per unit

Minimum Transfer Price would be ₹ 1,750 per unit

Illustration 4 :

Hari Ltd. consists of the X division and the Y Division. X Division produce two different components, the new high performance ALFA and an older product called BETA. These two products have the following cost characteristics.

ALFA	BETA
Material Parts ₹20	Parts ₹ 10
Labour 2 hours × ₹140 =₹280	½ hours × ₹ 140 = 70

Annual overhead in X Division is ₹10,00,000 all fixed. The X Division capacity is set at 50,000 hours per year.

To date, only one customer has developed a product utilizing ALFA, and this customer orders a maximum of 15,000 ALFA per year at a price of ₹600 per unit. If Hari Ltd. cannot meet his entire demand, the customer curtails his own production. The rest of the X's capacity is devoted to BETA, for which there is unlimited demand at ₹120 per unit.

The Y Division produces only one product, a GAMA, which requires a complex circuit board imported at a price of ₹ 600. The GAMA costs are:

	GAMA	₹
Material	Circuit board	600
Labour	Other parts	80
	5 hours @ ₹100	500

The Y Division is composed of only a small assembly plant and all overhead is fixed at a total of ₹20,00,000 per year. The current market price for the GAMA is ₹ 2,000 per unit.

The Production manager discovered that with minor modifications, a single ALFA could be substituted for the circuit board, currently used by Y division, the modification would require an extra one hour of labour by Y's staff for a total of 6 hours per unit of GAMA.Y has, therefore asked X Division to declare a transfer price at which X Division would Sell ALFA a internally.

Required:

1. Y expects to sell 6,000 of GAMA this year. From the overall point of view Hari Ltd, how many X should be transferred to Division Y to replace circuit boards?
2. What should be the transfer Price for such 6000 units?
3. If demand for the GAMA rises to 12,000 units at a price of ₹2000 per unit, how many of 12,000 units should be built ALFA? (All other data unchanged).

Solution :

1. Division X

	Hours	Ranking
Alpha (15000 × 2)	30,000	I
Beta (40,000 × ½)	20,000	II
Division Y		
Board (Total)	50,000	

X Division has no spare capacity, hence in order to produce extra unit of Alpha for transfer, X division will have to sacrifice the required labour hours from the product having least Contribution/hour.

Statement of Ranking

	ALPHA	BETA
Selling Price	600	120
Variable Cost	300	80
Contribution per unit	300	40
	ALPHA	BETA
Hours per unit	2	1/2
Contribution per hour	150	80
Ranking	1	II

Statement of Optimum Product Mix

	Unit	**Hour per unit**	**Hours**
ALPHA	15000	2	30,000
BETA	40,000	1/2	20,000 (B/F)
			50,000

The requirement of Y division is 6000 (u) of ALPHA to replace circuit board which can be produced by Division X by releasing labour hour from BETA subject to the interest of Company.

Statement of Comperative Cost (6000 unit)

Manufacture	**Per unit**	**Purchase**	**Per Unit**
ALPHA			
V.C	300	Purchase cost of Board	600
+ Contribution to be lost 2 hour X 40/½	160		
Total	460		
+ Extra Cost to be incurred by Y	100		
Total Relevant Cost	560	Purchase Cost	600

X division can produce extra units of Alpha as 6000(unit) for Y division but maximum unit would be:

20,000/2 = 10,000 (unit).

2. Transfer Price would be 460 for each unit of ALPHA up to 6000 (unit)

Transfer Price = ₹ 460 to 500.

3. If the requirement of Y dept. increase to 12,000(unit) than X dept. can produce of transfer 10,000 (unit) of ALPHA by reducing its product BETA. However in order to produce & transfer over and above 10,000(unit) X dept. will have to reduce subject to the interest of Co.

Statement of Comparition Cost

Manufacture		Purchase Cost	
V.C.	300		
+ Contribution lost	300	Purchase Cost	600
	600		
+ Extra Cost	100		
Total	700	Total	600

X dept. should not produce & transfer over and above 10,000 (units) of ALPHA.

Illustration 5 :

Shri Ltd. has a system of evaluating divisional performance on the basis of Economic Value Added. The corporation operates two divisions: DELTA and THETA. Delta has annual capacity to manufacture 100 lakh units of a unique electronic component, which it sells to outside customers; however, there is underutilized capacity in DELTA. The budgeted EVA for the Theta division is ₹450 lakh, while that for DELTA is ₹900 lakh.

Other relevant details extracted from the Budget of Delta for the year are as follows:

Sale (to outside customers) 50 Lakh units	₹250 per unit
Variable Cost per unit	₹200
Divisional fixed cost	₹ 800 Lakhs
Capital employed	₹10,000 Lakhs
Cost of Capital	10%

Theta has recently received a special order for the same component produced by Delta, but with a minor modification in the final production stage. Theta has approached DELTA to provide 50 lakh units of this modified component. DELTA, aware of its idle capacity, is ready to take the order but needs to account for an additional variable cost of ₹15 per unit due to the modification.

(i) Calculate the transfer price which Delta should quote to Theta to achieve its budgeted residual income.

(ii) Explain the situations where the proposed transfer price might result in a sub optimal decision for Shri Corporation as a whole.

Solution :

Statement of Current EVA for Delta

Particulars		₹ Lakh
Sale	250 × 50,00,000	12,500
- Cost		
Variable Cost	200 × 50,00,000	10,000
	Contribution	2,500
- Fixed Cost		8,00
Business	Profit	1,700
- Normal Profit	10,000,00,000 × 10%	1000
EVA		7,00
Target EVA		9,00
Deficit EVA		2,00

Statement of Transfer Price

		₹ Per unit
Cost to be incurred		200
+ Modification Cost		15
Relevant Cost		215
+Deficit to be recovered	2,00,00,000/50,00,000	4
	Transfer Price As suggested by Mgt.	219

(ii) If the external market offers the component at a price lower than the relevant cost (₹219 per unit), for instance, at ₹215 or ₹210 per unit, then Theta should purchase the components from the external market instead of sourcing them from DELTA. In such a case, Delta's transfer price of ₹219 per unit would not be competitive, and the company as a whole could incur a loss by continuing the internal transfer arrangement. Thus, the proposed transfer price would no longer be relevant, and it would result in a sub-optimal decision for Shri Corporation to maintain the internal transfer.

Illustration 6 :

MNC Ltd. has two divisions, T and Q. The Division T is currently operating at full capacity. It has been asked to transfer its product to Division Q. Division T sells its product to its regular customer for ₹80 each .Division Q (currently operating at 50% capacity) is willing to pay ₹50 each for the component produced by Division T (this represents the full absorption cost per component at Division T). The component will be used by Division Q in supplementing its main product to conform to the need of special order. As per the contract terms of sales, the buyer calls for reimbursement of full cost to Division Q plus 10%.

Division T has a variable cost of ₹40 per component. The cost per unit of Division Q subsequent to the buying part from Division T is estimated as follows:

Purchased Parts - Outside Vendors	₹ 150
Purchased Parts - Division T	₹ 50
Other Variable Costs	₹ 70
Fixed Overheads and administration	₹ 100
	₹ 370

The company uses return on investment in the measurement of division manager's performance.

(i) As manager of Division T would you recommend transferring your product to Division Q at the stipulated Price of ₹50?

(ii) Would it be in the overall interest of the company for Division T to transfer its product to Division Q at the proposed price?

Solution :

(i) Division T is currently operating at full capacity, and the market is absorbing all of its output at ₹80 per unit. Therefore, transferring the product to Division Q at ₹50 per unit would mean a loss of ₹30 per unit compared to selling externally. Since Division T is operating at full capacity, the opportunity cost of internal transfer is high.

(ii) Decision analysis (whether to transfer the product from Division T to Division Q at ₹40 per unit or not):

Particulars	Sold Externally	Transferred to Division Q
Sales Prices (Division T)	₹80.00	₹50
Sales Price (Division Q) (₹370 + 10% of ₹370)	-	₹407.00
Less : Relevant incremental Cost		
For part of Division T	₹ 40.00	₹ 40.00
Purchased parts from outside	-	₹ 150.00
Other variable Costs	-	₹ 70.00
Profit per unit	₹ 40.00	₹ 147.00

The transfer would increase the firm's profit by ₹107 per unit (₹147 - ₹40). Thus, it is beneficial for the firm to transfer the part from Division T to Division Q.

Illustration 7 :

BL Company Ltd. is a leading manufacturer of a certain consumer durable product. The company has two divisions-Engineering and Assembly. The output of the engineering division is transferred to the assembly division for further processing and assembling before being sold to the customer as complete product. Verification of the company's records reveals that the variable cost per unit of the product for engineering and assembly are ₹300 and ₹350 respectively. The fixed cost of engineering division is ₹12,000 and that of the assembly division is ₹8,000. The product variable cost per unit of engineering division is ₹500, and the total output is 120 units which are sold to customer on completion @ ₹2,500 per unit. If the engineering division decides to charge its transfers to assembly division at cost plus 120%. What will be BL overall profit and the profits of its two divisions under the cost-based transfer pricing method?

Solution :

BL Co. Ltd.'s overall profit and divisional profits

Items of expenses and revenue	Divisions		Total revenue, expenses and income of the company
	Engineering	Assembly	
A. Revenue 120% of cost, i.e. 120% of (B) for Engineering division, and the Market price for Assembly division	1,32,000	3,00,000	3,00,000
B. Expenses 1. Product variable cost (₹500 × 120 units)	60,000	-	60,000
2. Transferred cost	-	1,32,000	-
3. Division variable cost	36,000	42,000	78,000
4. Division fixed cost	12,000	8,000	20,000
Total expenses (1+2 + 3+4)	1,08,000	1,82,000	1,58,000
Operating income /Profit	24,000	1,18,000	1,42,000

Notes:

(i) Products passing through the assembly division are the final products which are sold to external buyers at ₹2,500 per unit. Hence, the company's revenue should be equal to the revenue of the Assembly division, i.e. 120 units @ ₹2,500 per unit (or ₹3, 00,000).

(ii) Operating income of the two divisions taken together should be the operating income of the company. Thus, BL Ltd.'s overall profit is ₹1,42,000 with ₹24,000 profit for the Engineering Division and ₹1,18,000 profit for the Assembly Division under the cost-based transfer pricing method.

Illustration 8 :

Better Margins Ltd. Manufactures a consumer Electronic product COM 10, in its Division A The division has been given a budgeted target of selling 2,00,000 units of COM 10 at a price that would provide a return of 30% on the average assets employed by division. The relevant details for Division A are as follows:

Fixed overhead	₹ 4,00,000
Variable cost	₹2 per unit
Average assets :	
Sales debtors	2,00,000
Stocks	6,00,000
Plant and other assets	4,00,000

However, after conducting a market survey, the marketing department discovers that the maximum market demand at the proposed price is only 1,40,000 units

Fortunately Division B is willing to purchase the balance 60,000 units. The Manager, Division A is willing to sell to Division B at a concessional price of ₹4 per unit. But the Manager, Division B is willing to pay ₹3.75 only per unit, as he believes his division can produce COM 10 in his Division at this price.

Rather than sell to Division B at ₹3.75, the Manager, Division A feels he will restrict the activity of his Division to the manufacture and sale of 1,40,000 components only. By this, he could reduce ₹80,000 in stocks, ₹1,20,000 of plant and other assets and ₹40,000 in selling and administration expenses.

As a Cost Accountant, you are asked to work out the various computations and show that selling 60,000 COM 10 to Division B at ₹3.75 per unit would be in the interest of the organization.

Solution :

Neither selling price nor total sales is given. Division A of Better Margins Ltd. expects a return of 25% on average assets employed i.e., ₹12, 00,000.

Total sales will be	₹
(a) Profit (30% of 12, 00,000)	3,60,000
(b) Fixed overhead	4,00,000
(c) Variable cost (2, 00,000 × ₹ 2)	4, 00,000
Total sales	11,60,000
Sales per unit (₹11, 60,000 ÷ 2, 00,000 units)	5.80

	Transfer to Division and Sale to outside parties only	Sale to outside parties
Sales (units)	2, 00,000	1, 40,000
Sales value (1, 40,000 units @ ₹ 5.80) (60,000 units @ ₹ 3.75)	10,37,000	8,12,000
Less: Variable cost (₹ 2 per unit)	4,00,000	2,80,000
Contribution	6,37,000	5,32,000
Less: Fixed overhead	4,00,000	3,60,000 *
Net profit	2,37,000	1,72,000
Average assets employed	12 00,000	10,00,000
Return on investment	19.75%	17.20%

If the component is transferred to Division B as well as sold to outside parties, it is more profitable as the contribution, net profit and return on investment is more than the existing proposal. Therefore selling the components to Division B at ₹3.75 per unit is in the overall interest of the company.

*Reduction in selling and administration expenses (fixed in nature) by ₹40,000

Illustration 9 :

A company fixes the inter-divisional transfer prices for its products on the basis of cost, plus a return on investment in the division. The Budget for Division A for 2023-2024 appears as under:

Investment in Division A	₹
Fixed Assets	6,00,000
Current Assets	3,00,000
ebtors	2,00,000
Annual fixed cost of the division	8,00,000
Variable cost per unit of product	12
Budgeted volume	4,00,000 units per year
Desired ROI	30%

Determine the transfer price for Division A.

Solution :

The desired rate of return is 30% on investments. Investments include:

(i) Fixed assets after depreciation

(ii) Net working capital

In the question, current assets and debtors are given but current liabilities and creditors are not indicated. Therefore, these are assumed to have nil value.

Investments		₹
Fixed assets		6, 00,000
Net working capital	₹	
Current assets	3, 00,000	
Debtors	2, 00,000	5, 00,000
Total investments		11, 00,000

The desired rate of return is 30%

The profit margin will be:

$\{\frac{30}{100} \times 11,00,000\}$	₹. 3, 30,000
Budgeted volume	4, 00,000 units

	₹
Profit margin per unit (₹ 3,30,000 ÷ 4, 00,000 units)	0.825
Fixed cost per unit (₹8, 00,0000 ÷ 4,00,000 units)	2.00
Variable cost per unit	12.00
Transfer price per unit	14.825

Illustration 10 :

XYZ Cycles Ltd has 2 divisions, A and B which manufacture bicycle. Division A produces the bicycle frame and Division B assembles rest of the bicycle on the frame. There is a market for both the sub-assembly and the final product. Each division has been treated as a profit center. The Transfer Price for the sub-assembly has been set at the long run average market price.

The following data are available to each division-

Estimated Selling Price for Final Product	₹ 4,500 p.u.
Long-run Average Market Price for sub-assembly	₹ 3,000 p.u.
Incremental Costs of completion sub-assembly in Division B	₹ 2,000
Incremental Costs in Division A	₹ 1,500

Required :

1. Division A's maximum capacity is 1,200 units per month and sales to the intermediate market are now 1,000 units. Should 200 units be transferred to Division B at the long run average price basis?
2. What would be the Transfer Price, if the Manager of Division B should be kept motivated?
3. If outside market increases to 1,200 units, should Division A continue to transfer 200 units to Division B or sell entire production to outside market?

Solution :

1. When External Sales = 1,000 units
   (a) Since External Sales of Sub-Assembly by Division A is only 1,000 units, there is a spare capacity of 200 units, which does not involve any Opportunity Costs.
   (b) Cost of the fully assembled vehicle from the company's perspective = Variable Costs of A + Variable Costs of B = ₹1,500 + ₹2,000 = ₹3,500 p.u. Since Final Selling Price (₹4,500) is above cost (₹3,500), there is a Net Contribution of 1,000 per unit of the Final product. Hence, 200 units may be transferred by Division A.
2. Range of Transfer Prices will be as under-
   (a) Minimum TP (from Division A viewpoint) = Variable Costs only = ₹1,500 only
   (b) Maximum TP (from Division B viewpoint) = Least of -
      (i) Market Price of Sub-Assembly [or]
      (ii) Ability to pay = ₹3,000 [or] (₹4,500 - ₹2,000) = ₹2,500.
   (c) A Transfer Price in the range of ₹1,500 to ₹2,500 will be agreeable to both Managers.
   (d) To keep the Manager of Division B motivated, the profit earned (1,000 per unit) may be shared equally between the two Divisions. Hence, the appropriate Transfer Price for motivating Division B may be Variable Cost of Division A + 50% Share of Profit to be given to Division A = ₹1,500 + ₹500 = ₹2,000
3. When External Sales = 1,200 units
   (a) If External Sales by Division A increases to 1,200 units, Internal Transfer would involve Opportunity Costs. Hence, Relevant Cost of Internal Transfer = Variable Costs ₹ 1,500 + Opportunity Costs ₹ 1,000 (being Contribution foregone on External Sales) = ₹ 2,500.
   (b) Cost of the fully assembled vehicle from the company's perspective = Relevant Costs of A+ Relevant Costs of B = ₹2,500 +₹ 2,000 = ₹ 4,500 p.u. Since Final Selling Price (₹4,500) is equal to the Relevant Cost (₹4,500), per unit, there is no contribution from the internal transfer. Hence, internal transfers are not worthwhile. Division X should sell the entire output of 1,200 units to the outside market only.

Illustration 11:

ZOYA CORPORATION has two divisions. The MINING Division brings out a basic product BOLDINE, which is then transferred to the METALS Division. BOLDINE is processed further in Metals Division into articles and is sold to customers at a price of 150 per unit.

The Mining Division is currently required by MINMET to transfer its total yearly output of 400,000 units of BOLDINE to the Metals division at 110% of Full Manufacturing Cost.

Unlimited quantities of BOLDINE can be purchased and sold in the outside market at 90 per unit. To sell the BOLDINE it produces at 90 per unit in the outside market, the Mining Division would have to incur variable Marketing and Distribution Costs of 5 per unit. Similarly, if the Metals Division purchased BOLDINE from the outside market, it would have to incur variable purchasing costs of 3 per unit.

The following table gives the Manufacturing Costs per unit in the MINING and METALS Division for the next year.

Particulars	MINING Division	METALS Division
Direct Materials	12	6
Direct Manufacturing Labour	16	20
Manufacturing Overhead	32 (25% fixed and 75%variable)	25
Manufacturing Costs per unit	60	51

Required:

1. Calculate the Operating Incomes for the Mining and Metals Divisions for the 400,000 units of TOLDINE transferred under each of the following transfer-pricing methods (a) Market Price, and (b) 110% of Full Manufacturing Costs.
2. If the company rewards each Division Manager with a bonus of 1% of Division Operating Income (if positive), what is the amount of bonus that will be paid to each Division Manager under each of the Transfer Pricing methods in Requirement 1?

Which transfer-pricing methods will each Division Manager prefer to use?

Solution :

1. Basic Data

Particulars	MINING Division (₹)	METALS Division (₹)
Direct Materials	12	6
Direct Labour	16	20
Variable Overhead	32 × 75% = 24	25 × 40% = 10
Total Variable Costs p.u.	52	36
Fixed Overheads per unit	32 × 25% = 8	25 × 60% = 15
Total Fixed Overheads	4,00,000 units × 8 = 32,00,000	4,00,000 units × 8 = 60,00,000

Transfer Prices are - (a) Market Price = ₹90 & (b) 110% of Full Manufacturing Costs = ₹60×110% = ₹66

2. Computation of Divisional Profitability and Bonus at different Transfer Prices

(amounts in ₹)

	When TP = ₹90		When TP = ₹66		
Division	**Mining**	**Metals**	**Mining**	**Metals**	**Metals**
(a) Quantity	4,00,000 units	4,00,000 units	4,00,000 units	4,00,000 units	4,00,000 units
(b) Price per unit	90	150	66	150	150
(c) Variable Costs Own Transfer In	52 -	36 90	52 -	36 66	36 66
Sub-Total Variable Costs pu	52	126	52	102	102
(d) Contribution p.u	38	24	14	48	48
Total Contribution Less: Fixed Costs Profit	1,52,00,000 (32,00,000) 1,20,00,000	96,00,000 (60,00,000) 36,00,000	56,00,000 (32,00,000) 24,00,000	1,92,00,000 (60,00,000) 1,32,00,000	1,92,00,000 (60,00,000) 1,32,00,000
Bonus at 1% of Profits	1,20,000	36,000	24,000	1,32,000	1,32,000

Note: Total Company Profits and Total Bonus Payment remain constant irrespective of the Transfer Price.

1. Manager Preferences:
   - Mining Manager will prefer transfer price of ₹90 being the market Price.
   - Metals Manager will prefer transfer price of ₹66 being 110% of Full Manufacturing Costs.
2. Negotiable Range of transfer prices:
   (a) Since the product is freely saleable in the outside market, Opportunity costs of Mining division = Contribution foregone on external sales = ₹90 - ₹52 - ₹5 (Selling Price - Variable Production Costs - S&D Costs) = ₹33 per unit. So, Minimum Transfer Price for Mining Division will be Variable costs + Opportunity costs = ₹52 + ₹33 = ₹85 per unit.

   (b) Maximum Transfer Price payable by Metals Division ₹90+₹3 (being market price + associated purchaser costs) = ₹93 per unit

   (c) Transfer Price of ₹90 lies in the range of ₹85 to ₹93 and hence will agreeable to both managers.

Illustration 1 :

Calculate the missing data for Company KRISO Ltd., as denoted by the question marks in the provided details below.

	Product R	Product S
Standard Sales Qty.(Units)	? ? ?	400
Actual Sales Qty. (Units)	500	? ? ?
Standard Price/Unit	₹12	₹15
Actual Price/Unit	₹15	₹20
Sales Price Variance	? ? ?	? ? ?
Sales Volume Variance	₹1,200 (F)	? ? ?
Sales Value Variance	? ? ?	? ? ?

Sales Mix Variance for both the products together was ₹450 (F). 'F' denotes favorable.

Solution :

i. Sales Volume Variance for R = Col.(1) - Col.(3) = (BQ × BP) - (AQ × BP) = ₹ 1,200 F

So, (BQ × ₹ 12) - (500 × ₹ 12) = - 1,200 Hence, 12BQ = 4,800. So, BQ for R = 400 units.

ii. Budgeted Mix between R and S = 400 : 400, i.e. 1: 1

iii. Sales Mix Variance for R and S = Col.(2) - Col. (3) = (RAQ × BP) - (AQ × BP) = ₹ 450 F.

Let AQ of Product S be Q units. Hence Total AQ = (R + S) = (500 + Q)

Rewriting in budgeted mix (1:1), RAQ for R and S are each (500+Q)/2 and (500+Q)/2 respectively.

Since Col.(2) - Col. (3) is 450F, we have [(500+Q)/2*12+(500+Q)/2*15]-(500×12+Q×15) = -450

Upon simplifying, we have, 6,750 + 13.5Q - 6,000 - 15Q = -450

On solving the above, 1.5Q = 1,200 or Q = 800 units. Hence, AQ for S = 800 units.

iv. Revised Actual Quantity = 500 + 800 = 1,300 units re-written in the ratio 1: 1, i.e. 650 units each for R and S.

v. Variance Computation Chart

Particulars	Col. (1): BQ × BP	Col. (2): RAQ × BP	Col. (3): AQ × BP	Col. (4): AQ × AP
Product R	(WN 1) 400 units × ₹12 = ₹4,800	(WN 4) 650 units × ₹ 12 = ₹7,800	(given) 500 units × ₹ 12 = ₹000	(given) 500 units × ₹15 = ₹ 7500
Product S	(given) 400 units × ₹ 15 = ₹ 6,000	(WN 4) 650 units × ₹15 = ₹ 9,750	(WN 3) 800 units × ₹ 15 = ₹ 12,000	(WN 3) 800 units × ₹ 20 = ₹ 16,000
Total	**₹ 10,800**	**₹ 17,550**	**₹ 18,000**	**₹ 23,500**

Answer:

Particulars	Product R	Product S
Standard Sales Quantity (units)	400 units (WN 1)	400 units(given)
Actual Sales Quantity (units)	500 units (given)	800 units (WN3)
Standard Price per unit	₹12 (given)	₹15 (given)
Actual Price per unit	₹15 (given)	₹20 (given)
Sales Price Variance = Col.(3) - Col. (4)	₹1,500 F	₹4,000 F
Sales Volume Variance = Col.(1) - Col. (3)	₹1,200 F	₹6,000 F
Sales Value Variance = Col.(1) - Col. (4)	₹2,700 F	₹10,000 F

Illustration 2 :

Sharma & Co, utilized a comprehensive standard costing system, with raw materials inventory valued at standard cost. The following information has been extracted from the company's records for the year ended December 31, 2024

	₹
Opening raw materials inventory	300
Closing raw materials inventory	250
Net purchases	410
Material price variance	10 (A)
Material usage variance	20 (A)
Direct labour cost (Actual)	900
Direct labour cost at standard	840
Actual overhead cost incurred	900
Overheads cost variance	70 (F)
Opening work-in-progress inventory	120
Closing work-in-progress inventory	140
Opening finished goods inventory	360
Cost of goods sold reported	2500

Note: "F" denotes favourable and "A" denotes adverse.

You are required to compute:

i. Raw material Purchases at standard.

ii. Raw materials consumed at standard.

iii. Labour cost variance.

iv. Standard overhead costs.

v. Total manufacturing cost at standard.

vi. Cost of goods manufactured.

Solution :

i.	Raw Material Purchases at Standard	
	Net Purchases at actual	410
	Less: Material Price Variance (A)	10
		400
ii.	Raw Materials Consumed at Standard	
	Opening Stock at Standard	300
	Add: Purchases at Standard (as per 1)	400
		700
	Less: Closing Stock at Standard	250
		450
iii.	Labour Cost Variance	
	Direct Labour Cost at Standard	840
	Less: Actual Direct Labour Cost	900
	Adverse	60
iv.	Standard Overhead Cost	
	Actual Overhead Cost	900
	Add: Overhead Cost Variance (Favourable)	70
		70
v.	Total Manufacturing Cost at Standard	
	Standard Raw Material Cost	450
	Standard Direct Labour Cost	840
	Standard Overhead Cost	970
		2,260

vi. Cost of Goods Manufactured (at Standard)

Opening WIP (at Standard)	120
Add: Total Cost of Goods Manufactured (at Standard)	2,260
Less: Closing WIP (at Standard)	140
	2,240

Illustration 3 :

KMLKO Ltd. has disclosed the following data for the month of January:

	Budget	Actual
Outputs (units)	30,000	32,500
Hours	30,000	33,000
Fixed overhead	45,000	50,000
Variable overhead	60,000	70,000
Working days	25	26

Calculate overhead variances.

Solution :

Calculations

Standard hour per unit = Budgeted hours ÷ Budgeted units = 30,000 ÷30,000

Standard hour for actual output = 32,500 units × 1 hour = 32,500

Standard overhead rate per hour = Budgeted overheads ÷ Budgeted units

= For fixed overhead = 45000/30000 = ₹1.50 per unit

For variable overhead = 60,000/30,000 = ₹2 per unit

Standard fixed overhead rate per day = ₹45,000 ÷ 25 days = ₹1,800

Recovered overhead = Standard hours for actual output × Standard Rate

For fixed overhead = 32,500 hours × ₹1.50 = ₹48,750

For variable overhead = 32,500 hours × ₹2 = ₹65,000

Standard overhead =Actual hours × Standard Rate

For fixed overhead =33,000 × 1.50 =₹49,500

For variable overhead =33,000 × 2 = ₹66,000

Revised budgeted hours= (Budgeted hours÷ Budgeted Days) × Actual days

(30,000÷25) × 26 = 31,200 hours

Revised budgeted overhead = 31,200 × 1.50 = ₹46,800

Calculation of Variances Fixed Overhead Variances:

- Fixed Overhead Cost Variance = Recovered Overhead – Actual Overhead
  = 48,750 – 50,000 = ₹1,250 (A)
- Fixed Overhead Expenditure Variance = Budgeted Overhead – Actual Overhead
  =45,000 – 50,000 = ₹5,000 (A)
- Fixed Overhead Volume Variance = Recovered Overhead – Budgeted Overhead
  = 48,750 – 45,000 = ₹3,750 (F)
- Fixed Overhead Efficiency Variance = Recovered Overhead – Standard Overhead
  = 48,750 – 49,500 = ₹750 (A)
- Fixed Overhead Capacity Variance = Standard Overhead – Revised Budgeted Overhead
  = 49,500 – 46,800 = ₹2,700 (F)
- Calendar Variance=(Actual days – Budgeted days) × Standard rate per day
  = (26—25) × 1,800 = ₹1,800 (F)

Variable Overhead Variances:

- Variable Overhead Cost Variance = Recovered Overhead – Actual Overhead
  = 65,000 – 70,000 = ₹5,000 (A)
- Variable Overhead Expenditure Variance = Standard Overhead – Actual Overhead
  = 66,000 – 70,000= ₹4,000(A)
- Variable Overhead Efficiency Variance= Recovered Overhead - Standard Overhead
  = 65,000 - 66,000 = ₹1,000 (A)

Illustration 4 :

KHOLI Ltd. manufactures a specific product, for which the standard direct labour cost is ₹120 per unit. The production process for this product includes the following:

Type of workers	Hours	Rate (₹)	Amount (₹)
A	30	2	60
B	20	3	60
	50		120

During a period, 100 units of the product were produced, the actual labour cost of which was as follows:

Type of workers	Hours	Rate (₹)	Amount (₹)
A	3,200	1.40	4480
B	1,900	3.60	6840
	5,100		11,320

Calculate:

(1) Labour cost variance

(2) Labour Rate variance

(3) Labour Efficiency variance

(4) Labour mix variance.

Solution :

Type of Worker	Standard for 100 units			Actual for 100 units		
	Hours	Rate	Amount	Hours	Rate	Amount
A	3,000	2	6,000	3,200	1.40	4,480
B	2,000	3	6,000	1,900	3.60	6,840
Total	5,000		12,000	5,100		11,320

(1) LCV: SC -AC

LCV = 12,000 - 11,320 = ₹ 680 (F)

(2) LRV: (SR - AR) × AH

A = (2 - 1.40) × 3,200 = ₹ 1,920 (F)

B = (3 - 3.60) × 1,900 = ₹ 1,140 (A)

= ₹ 780 (F)

(3) LEV: (SH - AH) × SR

A = (3,000 - 3,200) × 2 = ₹ 400 (A)

B = (2,000 - 1,900) × 3 = ₹ 300 (F)

= ₹ 100 (A)

(4) LMV: (RSH - AH) × SR

A = (3,060 - 3,200) × 2 = ₹ 280 (A)

B = (2,040 - 1,900) × 3 = ₹ 420 (F)

= ₹ 140 (F)

Working: Revised standard Hours:

RSH = St. hours of the type × Total actual hours / Total St. hours

A = 3,000 × 5,100 / 5,000 = 3,060 hrs.

B = 2,000 × 5,100 / 5,000 = 2,040 hrs.

Illustration 5 :

From the provided financial data of BK Ltd., calculate the following variances:

(i) Variable Overhead Cost Variance;

(ii) Variable Overhead Expenditure Variance and

(iii) Variable Overhead Efficiency Variance:

Budgeted production	6,000 units
Budgeted variable overhead	₹. 1,20,000
Standard time for one unit of output	2 hours
Actual production	5,900 units
Actual overhead incurred	₹. 1,22,000
Actual hours worked	11,500 hours

Solution :

Workings:

1. Standard cost per unit = ₹1,20,000/ 6,000 units = ₹20
2. Standard cost per hour = ₹1,20,000 /(6,000 units × 2 hours) = ₹10

(i) Variable Overhead Cost Variance:

= Std. Overhead for actual production – Actual overhead incurred

= ₹20 × 5,900 units – ₹1,22,000 = ₹4,000 (A)

(ii) Variable Overhead Expenditure Variance:

= Std. overhead for Actual hours – Actual Overhead

= ₹10 ×11,500 hours - ₹1,22,000 = ₹ 7,000 (A)

(iii)Variable Overhead Efficiency Variance:

= Std. rate per hour × (Std. hours for actual production – Actual hours)

= ₹10 (2 hours × 5,900 units – 11,500 hours) = ₹ 3,000 (F)

Illustration 6 :

ABCD Ltd. Company has a normal capacity of 120 Machines, Working 8 hours per day for 25 days in a month. The fixed overheads are budgeted at ₹ 1,44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In April, 2024, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were ₹ 1,40,000. Calculate:

(i) Expense variance

(ii) Volume variance

(iii)Total fixed overheads variance.

Solution :

	Budget	Actual
1. Working hours per month	24,000	20,160
2. Production units per month = (Budget 24,000 ÷ 4 hrs, Actual given)	6,000	5,305
3. Standard fixed overhead rate per unit = ₹ 1,44,000 ÷ 6,000 = ₹ 24		
4. Standard fixed overhead rate per hour = ₹ 1,44,000 ÷ 24,000 = ₹ 6		
5. Standard fixed overhead rate per day = ₹ 1,44,000 ÷ 25 = ₹ 5,760		

Fixed Overhead Variances:

Actual Fixed overhead incurred = ₹1,40,000 (given)

Budgeted fixed overhead for the period = ₹ 1,44,000.

Standard fixed overhead for actual Production

= (Standard output for actual time × Standard Fixed Overhead per unit)

= 5,305 × ₹ 24 = ₹ 1,27,320.

Variances:

(i) F.O. Expenditure Variance = (Budgeted fixed overhead – Actual fixed overhead)

= 1,44,000 – 1,40,000 = ₹ 4,000 (F)

(ii) Total Volume Variance = (Standard fixed overhead – Budgeted fixed overhead)

= 1,27,320 – 1,44,000 = ₹16,680 (A)

(iii)Fixed overhead variance= (Standard fixed overhead – Actual Fixed overhead)

= 1,27,320 – 1,40,000 = ₹12,680 (A)

Illustration 7 :

Fitstyle Ltd. specializes in the manufacture of high-quality ready-made shirts, producing them in Lots, tailored to specific orders from overseas clients. The company has established standard costs for producing one dozen shirts, as outlined below: –

Direct Materials (24 meters at ₹11)	₹ 264
Direct Labour (3 hours at ₹49)	₹ 147
Overheads (3 hours at 40)	₹ 120

During July it worked on three orders, for which the month's job cost records show the following-

Lot No.	Units	Materials used	Hours worked
45 Paris	1,700 Doz.	40,440 metres	6,130
46 Berlin	1.200 Doz.	28,825 metres	3,890
47 Spain	1,000 Doz.	24,100 metres	3,980

Additional Information:

- During July, the company purchased 95,000 meters of material at a total cost of ₹10,64,000. The Material Price Variance is recognized at the time of purchase. All inventories are valued at cost.
- Direct Labour during July amounted to ₹ 7,00,000. The Employees were paid at 50 per hour.
- Overheads during the month amounted to ₹ 4,56,000.
- The total overheads for the year were budgeted at ₹57,60,000, based on estimated production of the Plant's normal capacity of 48,000 dozen shirts annually.
- The overheads for production at this level are comprised of 40% fixed costs and 60% variable costs. These overheads are allocated based on the number of direct labour hours worked.
- There was no Work in Progress at the beginning of July. During the month, Lot nos. 45 and 47 were completed. All materials were issued for Lot no. 46 which was 80% complete as regards conversion.

You are required to compute -

1. Standard Costs of Production of the Shirts per Dozen as well as in total for Lot Nos. 45, 46 and 47.
2. Variation in Quantity of Materials Used and Labour Hours Worked for each Lot as well as in total.
3. Material Price Variance, Labour Rate Variance, VOH Efficiency Variance and FOH Volume Variance.

Solution :

1. Computation of Lot-wise Standard Costs and Material and Labour Quantity Variations

Particulars	Lot 45 (Paris)	Lot 46 (Berlin)	Lot 47 (Spain)	Total
(a) Cost per Dozen	264+147+120 = 531.00	264+80% of (147 +120) = 477.60	264+147+120 = 531.00	
(b) Standard Costs of Production	1,700 × 531 = 9,02,700	1,200 × 477.6 = 5,73,120	1,000 × 531 = 5,31,000	**20,06,820**
(c) Std Quantity for Actual Output	1,700 ×24 metres = 40,800 metres	1,200 × 24 metres = 28,800 metres	1,000 × 24 metres = 24,000 metres	93,600 metres
(d) Actual Quantity Consumed	40,440 metres	28,825 metres	24,100 metres	93,365 metres
(e) Variation in Metres of Material	360 metres Fav	25 metres Adv	100 metres Adv	**235 metres F**
(f) Std Hours for Actual Output	1,700 doz. × 3 hrs = 5,100 hours	80% of 1,200 doz.× 3 hrs=2,880 hours	1,000 × 3 hrs = 3,000 hours	10,980 hours
(g) Actual Labour Hours worked	6,130 hours	3,890 hours	3,980 hours	14,000 hours
(h)Variation in Labour Hours	1030 hours Adv	1010 hours Adv	980 hours Fav	**3020 hours Adv**

2. Computation of Cost Variances

Particulars	Computation	Result
(a) Material Purchase Price Variance (since Question specifies that Price Variance is recorded at the time of purchase)	Std Cost of Purchase Quantity less Actual Cost of Purc Qtty = (95,000metres × ₹11) less ₹10,64,000 given	**₹19,000 A**
(b) Labour Rate Variance	(AH × SR)-(AH × AR) = (14,000 hours × ₹49)-(14,000 hours × ₹50)	**₹14,000 A**
(c) VOH Efficiency Variance NOTE: VOH = 60% of ₹40= ₹24	(SH x SR)-(AH × SR) = (10,980 hours ×₹24)-(14,000 hours × ₹24)	**₹ 3020 A**
(d) FOH Volume variance Note: FOH ph= 40% of ₹40 =₹16	Absorbed FOH less budgeted FOH =(SH*SR) – (BH*SR) =(10980*₹16)- (1/12th of 48000*3hrs*₹16)	**₹16,320 A**

Illustration 8 :

The following data has been extracted from the books of Nidhi & CO. which is using Standard Costing system-

Actual Output	9,000 units
Direct Wages paid	1,10,000 hrs at ₹22 ph of which 5,000 hours, being idle time, were not recorded in production

Standard Hours	10 hours per unit
Labour Efficiency Variance	₹3,75,000 (A)
Standard Variable OH	₹150 per unit
Actual Variable OH	₹16,30,000

Compute (a)Labour (Net) Efficiency Variance (b) Idle Time Variance, (c) Labour Rate Variance and (a) Variable OH Expenditure Variance, Total Variable OH Variance.

Solution :

1. Computation of Standard Wage Rate Per Hour

   Note: Labour Efficiency Variance given in question is taken as Labour (Net) Efficiency Variance, i.e. after adjusting Idle Time.

   - (SH × SR) (Net AH × SR) = 3,75,000A (adjusted net of Idle Time)
   - (9,000 units × 10 hours × SR) - [(1,10,000-5,000) × SR] = 3,75,000A = -15,000 SR = -3,75,000
   - On solving, SR = ₹25 per hour

2. Labour Cost Variances

Col.(1): SH × SR	**Col.(2): Net AH × SR**	**Col.(3): Total AH × SR**	**Col. (4): Total AH × AR**
(9,000 units x 10 hrs) × ₹25 ph = ₹22,50,000	(1,10,000-5,000) hrs × ₹25 ph = ₹26,25,000	1,10,000 hrs × ₹25 ph = ₹27,50,000	1,10,000 hrs × 22 ph =₹24,20,000

   Labour (Net) Efficiency Variance =₹22,50,000 - ₹26,25,000 = ₹3,75,000 A

   a) Labour Idle Time Variance = ₹26,25,000 - ₹27,50,000 = ₹1,25,000 A

   b) Labour Rate Variance = ₹27,50,000 - ₹24,20,000 = ₹3,30,000 F

   c) Total Labour Cost Variance = 22,50,000 - 24,20,000 = ₹1,70,000 A

3. Variable OH Cost Variances

   Note: Since 1 unit requires 10 hours and VOH per unit is ₹150, VOH per hour = ₹150 ÷ 10 hours = ₹15 Per hour

Col.(1): AO×SR (or)SH×SR	Col.(2): Net AH × SR	Col.(3):Total AH×SR	Col. (4):AVOH
(9,000 units × 150 pu) = ₹13,50,000	(1,10,000-5,000) hrs × ₹15 ph = ₹15,75,000	1,10,000 hrs × ₹15 ph = ₹16,50,000	given =₹16,30,000

   (Net) Efficiency Variance = 13,50,000 - 15,75,000 = ₹ 2,25,000 A
   Idle Time Variance =15,75,000 - ₹16,50,000 = 75,000 A

   a) Expenditure Variance = 16,50,000 - 16,30,000 = 20,000 F

   b) Total VOH Cost Variance = 13,50,000 - 16,30,000 = 2,80,000 A

Illustration 9 :

PQR Ltd provides the following information for April. Calculate the Variable OH Variances, Fixed OH Variances and Total OH Variances:

Particulars	Working days	Man hours	Output per man-hour	Fixed OH	Variable OH
Budget	20	40,000	3.2	32000	1,02,400
Actual	21	43,000	3.0	31500	1,14,800

Solution:

1. Rate Computation

   (a) Actual Output: = Actual man hours × Actual output per man hour = 43,000 × 3 = 1,29,000 units.

   (b) VOH SR per unit = Budgeted VOH ÷ Budgeted Output = ₹1,02,400 ÷ 1,28,000 units i.e. (40,000 × 3.20)= ₹0.80 per unit.

   (c) OH SR per hour = Budgeted VOH ÷ Budgeted Hours = ₹1,02,400/40,000 Hours = ₹2.56 per hour.

   (d) FOH SR per unit= Budgeted FOH ÷ Budgeted Output = ₹32,000 ÷ 1,28,000 units i.e. (40,000 × 3.20) = ₹0.25 per unit.

   (e) FOH SR per hour = Budgeted FOH ÷ Budgeted Hours = ₹32,000 ÷ 40,000 Hours = ₹0.80 per hour.

2. Computation for VOH Cost Variances:

Col. (1): SH × SR = AO × SR	Col. (2): AH × SR	Col. (3): AVOH
1,29,000units × ₹0.80= ₹.1,03,200	43,000 hrs × 2.56= ₹1,10,080	₹1,14,800 (given)

Efficiency Variable OH= ₹ 1,03,200-1,10,080= 6,880 A

Expenditure Variable OH = 1,10,080-1,14,800 = 4,720 A

Total VOH Cost Variance= ₹1,03,200-1,14,800 = 11,600 A

3. Computation of FOH Cost Variances

Col (1): AO x SR	Col (2): AH x SR	(3):PFOH=BFOH×(AD/BD)	Col (4):BFOH	Col (5): AFOH
1,29,000units × ₹0.25 = ₹32,250	43,000 hrs × ₹0.80 = ₹34,400	₹32,000×(21/20) = ₹33,600	₹32,000	₹31,500

Efficiency Variance =32,250 - 34,400 = 2,150 A

Capacity Variance = 34,400 - 33,600 = 800 F

Calendar Variance = 33,600 - 32,000 = 1,600 F

Expenditure Variance = 32,000 - 31,500 = 500F

FOH Volume Variance = 32,250 - ₹32,000 - ₹250 F

Total FOH Cost Variance = 32,250 - ₹31,500 = 750 F

Total OH Variance = VOH Variance + FOH Variance = 11,200 A + 750 F = ₹10,450 A

Illustration 10 :

The following details have been extracted from the Standard Cost Sheet for Product PQ:

(₹ per unit)

Variable Overhead:	4 Machine Hours at 8.00/hour	32.00
	2 Labour Hours at 4.00/hour	8.00
Fixed Overhead		20.00

In October, the actual production amounted to 5,450 units, slightly below the budgeted target of 5,500 units. The Actual Overhead Costs incurred were - (a) Machine Related Variable OH ₹1,76,000, (b) Labour Related Variable Overhead 42,000, and (c) Fixed Overhead ₹1,09,000.

The actual number of Machine Hours was 22,000 and the actual number of Labour Hours was 10,800.

Required:

1. Calculate the Overhead Cost Variances in as much detail as possible from the data provided.
2. Explain the meaning of, and give possible reasons for, the Variable OH Variances that you have calculated.
3. Explain the benefits of using multiple activity bases for Variable Overhead Absorption.

Solution :

1. Computation of VOH Variances

(a) VOH based on Machine hours		
Col. (1):SH × SR = AO × SR	Col.(2):AH × SR	Col.(3):AVOH
5,450 hrs × 32 = 1,74,400	22,000 hrs × 8 = 1,76,000	1,76,000

VOH Efficiency Variance = 1,74,400-1,76,000 = 1,600 A

VOH Expenditure Variance 1,76,000-1,76,000 = Nil

Total VOH Cost Variance = 1,74,400-1,76,000 = 1,600 A

(b) VOH based on Labour hours		
Col. (1):SH × SR = AO × SR	Col.(2):AH × SR	Col.(3):AVOH
5,450 hrs × 8 = 43,600	10,800 hrs × ₹.4 = 43,200	42,000

Efficiency Variance = 43,600 - ₹43,200 = 400 F

Expenditure Variance = 43,200 - ₹42,000 = 1,200 F

Total VOH Cost Variance = 43,600 - 42,000 = 1,600 F

2. Rate Computations for FOH

   (a) BFOH = BO × SR = 5,500 units × 20 = ₹1,10,000.

   (b) FOH SR per Machine hour = SR per unit/No. of Machine Hours = ₹20/4 Hours =₹5 per Machine Hour.

   (c) FOH SR per Labour hour = SR per unit/No. of Labour Hours = 20/2 Hours = 10 per Labour Hour.

3. Computation of FOH Variances

Col. (1) : AO × SR	Col.(2) : AH × SR		Col.(3) : BFOH	Col.(4) : AFOH
5,450units × 20 = ₹1,09,000	**Machine hrs** 22,000 hrs × 5 = ₹1,10,000	**Labour hrs** 10,800 hrs×10= 1,08,000	₹ 1,10,000	₹1,09,000

   FOH Efficiency Variance - Based on

   - Machine Hours = 1,09,000 - 1,10,000 = ₹ 1,000 A
   - Labour Hours = ₹1,09,000 - 1,08,000 = 1,000 F

   FOH Capacity Variance - Based on

   - Machine Hours = 1,10,000 - 1,10,000 = NIL
   - Labour Hours = ₹1,08,000 - 1,10,000 = 2,000 A

   FOH Expenditure Variance = 1,10,000 - ₹1,09,000 = 1,000 F

   FOH Volume Variance= ₹1,09,000 - ₹1,10,000 =1,000 A

   Total FOH Cost Variance = 1,09,000 - 1,09,000 = Nil

4. Benefits of using multiple activity bases for VOH absorption are -

   (a) Product costs can be determined on a more realistic basis, leading to enhanced pricing strategies and more informed decision-making overall.

   (b) A clearer understanding of the relationship between activities and cost behavior is achieved, helping to focus attention on the dynamics between these two factors.

   (c) Cost reduction activities within this area are more likely to be successful.

   (d) By recognizing that costs are not solely driven by production volumes, managerial focus is expanded, encouraging a more holistic perspective of the organization.

6 Forecasting, Budgeting and Budgetary Control [Study Material - Module 7]

Illustration 1 :

Prepare a flexible budget for the overheads of EXTET Co. Ltd., utilizing the following data. Ascertain the overhead rates at 50% and 60% capacity.

Variable overheads:	**At 60% capacity (₹)**
Indirect Material	6,000
Labour	18,000
Semi-variable overheads:	
Electricity: (40% Fixed & 60% variable)	30,000
Repairs: (80% fixed & 20% Variable)	3,000
Fixed overheads:	
Depreciation	16,500
Insurance	4,500
Salaries	15,000
Total overheads	93,000
Estimated direct labour hours	1,80,000

Solution:

Items	**Capacity**	
	50%	**60%**
Variable overheads:	₹	₹
Material	5,000	6,000
Labour	15,000	18,000
Semi-variable		
Electricity	27,000	30,000
Repairs	2,900	3,000
Fixed overheads:		

Deprecation	16,500	16,500
Insurance	4500	4500
Salaries	15,000	15,000
Total Overheads	**85,900**	**93,000**
Estimated direct labour hours	1,50,000	1,80,000
Overhead Rate	**0.57**	**0.52**

Working Note:

Electricity

At 50% capacity = 18,000/60 * 50 = ₹15,000

₹12,000 + ₹ 15,000 = ₹ 27,000

60% capacity = ₹ 18,000 + ₹ 12,000 = ₹30,000

Repairs

For 60% capacity = ₹600 = ₹ 2400 + ₹600 = ₹3,000

At 50% capacity : = 600/60 * 50 = ₹ 500

=₹2400 + 500 = ₹2,900

Illustration 2 :

The budgeted expenses for the production of 1,000 units at XYZW Ltd. are provided below:

Particulars	**Per Unit ₹**
Material Cost	700
Labour Cost	250
Variable overheads	200
Selling expenses (20% fixed)	130
Administrative expenses (₹6,00,000)	600
Total Cost	1,880

Prepare a budget for production of 600 units and 800 units assuming administrative expenses are rigid for all level of production.

Solution:

Flexible Budget

Particulars	For 600 units		For 800 units	
	Per unit ₹	Total ₹	Per unit ₹	Total ₹
Variable Cost:				
Materials Labour	700	4,20,000	700	5,60,000
Variable overheads	250	1,50,000	250	2,00,000
	200	1,20,000	200	1,60,000
(A)	**1,150**	**6,90,000**	**1,150**	**9,20,000**
Semi variable cost:				
Variable selling expenses Fixed selling	104	62,400	104	83,200
expenses	43.33	26,000	32.50	26,000
(B)	**147.33**	**88,400**	**136.50**	**1,09,200**
Fixed cost:				
Administrative expenses	1000	6,00,000	750.00	6,00,000
Total Cost (A+B+C)	**2297.33**	**13,78,400**	**2036.5**	**16,29,200**

Illustration 3 :

The budgeted output for PQR Co., which specializes in the production of a single product at its optimal capacity of 6,400 units per annum, is projected to amount to ₹1,76,048, as detailed below:

Particulars	₹	₹
Fixed costs		20,688
Variable costs:		
Power	1,440	
Repairs etc.	1,700	
Miscellaneous	540	
Direct material	49,280	
Direct Labour	1,02,400	1,55,360
Total cost		1,76,048

PQR Co. decides to have a flexible budget with a production target of 3,200 and 4,800 units (the actual quantity proposed to be produced being left to a later date before commencement of the budget period)

Prepare a flexible budget for production levels of 50% and 75%. Assuming, selling price per unit is maintained at ₹50 as at present, indicate the effect on net profit. Administrative, selling and distribution expenses continue at ₹3,600.

Solution:

The production at 100% capacity is 6400 units, so it will be 3,200 units at 50% and 4,800 units at 75% capacity. The variable expenses will change in that proportion.

Flexible Budget

Particulars	**100% (6400 units)**	**75% (4800 units)**	**50% (3200 units)**
(i)Sales (per unit ₹50)	3,20,000	2,40,000	1,60,000
Cost of Sales:			
(a)variable costs:			
Direct material	49,280	36,960	24,640
Direct Labour	1,02,400	76,800	51,200
Power	1,440	1,080	720
Repairs	1,700	1,275	850
Miscellaneous	540	405	270
Total variable costs	**1,55,360**	**1,16,520**	**77,680**
(b)Fixed Costs:	20,688	20,688	20,688
(ii) Total Cost	**1,76,048**	**1,37,208**	**98,368**
Gross Profit(i) - (ii)	**1,43,952**	**1,02,792**	**61,632**
Less: Adm., selling and Dist. Costs	3,600	3,600	3,600
Net Profit	**1,47,552**	**1,06,392**	**65,232**

Illustration 4 :

ABCD Co. Ltd. is scheduled to commence production on 1st January 2025. The anticipated prime cost per unit is ₹40, comprising ₹16 for materials and ₹30 for labor. Additionally, variable costs are expected to amount to ₹8 per unit, while fixed expenses are projected at ₹30,000 per month. Payments for materials will be made in the month following the purchase. Of the total sales, one-third will be on a cash basis, with the remaining two-thirds on credit, to be settled in the following month. Expenses will be paid in the month in which they are incurred. The selling price has been set at ₹80 per unit. The number of units to be produced and sold is expected to be:

January 900; February 1200; March 1800; April 2000; May 2,100, June 2400,

Prepare a Cash Budget that outlines the cash requirements for each month.

Solution:

CASH BUDGET of ABCD LTD.

For 6 months from January to June 2025

Month	**Jan.**	**Feb.**	**March**	**April**	**May**	**June**
Receipts						
Opening Balance		-40,200	-50,200	-55,800	-41,267	-20,400
Cash sales	24,000	32,000	48,000	53,333	56,000	64,000
Collection from Debtors		48,000	64,000	96,000	1,06,667	1,12,000
Total receipts(A)	24,000	39,800	61,800	93,533	1,21,400	1,55,600
Payments						
Creditors		14,400	19,200	28,800	32,000	33,600
Wages	27000	36000	54000	60000	63000	72000
Variable Exp.	7,200	9,600	14,400	16,000	16,800	19,200
Fixed Exp.	30,000	30,000	30,000	30,000	30,000	30,000
Total Payment(B)	64,200	90,000	1,17,600	1,34,800	1,41,800	1,54,800
Closing Balance	**-40,200**	**-50,200**	**-55,800**	**-41,267**	**-20,400**	**800**

Illustration 5 :

Winxi Ltd., a glass manufacturing company, has requested the preparation of the Master Budget for the upcoming year based on the following information:

Sales:	
Toughened Glass Bent Glass	₹6,00,000 ₹2,00,000
Direct material cost	60% of sales
Direct wages	20 workers @150 per month
Factory overheads:	
Indirect labour-	
Works manager Foreman	₹500 per month ₹400 per month
Stores and spares	2.5% on sales
Depreciation on machinery	₹12,600
Light and power	₹3,000
Repairs and maintenance	₹ 8,000
Others sundries	10% on direct wages
Administration, selling and distribution expenses	₹40,000 per year

Solution:

Master Budget

Sales:		₹
Toughened Glass		6,00,000
Bent Glass		2,00,000
Total Sales		8,00,000
Less: Cost of production:		
Direct materials (60% of ₹8,00,000)	4,80,000	
Direct wages (20 workers × ₹150 × 12months)	36,000	
Prime Cost	**5,16,000**	
Fixed Factory Overhead:		
Works manager's salary (500 × 12)	6,000	
Foreman's salary (400 × 12)	4,800	
Depreciation	12,600	
Light and power (assumed fixed)	3,000	
Variable Factory Overhead		
Stores and spares	20,000	
Repairs and maintenance	8,000	
Sundry expenses	3,600	
Works Cost		**5,74,000**
Gross Profit (Sales - Works cost)		2,26,000
Less: Adm., selling and distribution expenses		40,000
Net Profit		1,86,000

Illustration 6 :

PC Ltd. is preparing its budget for the second quarter of 2024-25 for its popular product, 'X'. The following information has been provided to assist in the budget preparation:

(i) The company anticipates selling 150,000 bags of 'X' during the second quarter of 2024-25, with a selling price of ₹1,200 per bag.

(ii) Each bag of 'X' requires 2.5 meters of raw material 'Y' and 7.5 meters of raw material 'Z'.

(iii)Planned stock levels for raw materials and finished goods are outlined as follows:

Particulars	Beginning of Quarter	End of Quarter
Finished Bags of 'X' (Nos.)	45,000	33,000
Raw - Material 'Y' (mtr)	96,000	78,000
Raw - Material 'Z' (mtr)	1,71,000	1,41,000
Empty Bag (Nos.)	1,11,000	84,000

(iv)'Y' cost ₹160 per mtr., 'Z' costs ₹30 per mtr. and 'Empty Bag' costs ₹120 each.

(v) It requires 9 minutes of direct labour to produce and fill one bag of 'X'. Labour cost is ₹70 per hour.

(vi)Variable manufacturing costs are ₹60 per bag. Fixed manufacturing costs ₹40,00,000 per quarter.

(vii)Variable selling and administration expenses are 5% of sales and fixed administration and selling expenses are ₹3,75,000 per quarter.

Required

(i) Prepare a production budget in terms of quantity for the second quarter of 2024-25.

(ii) Prepare a raw material purchase budget for raw materials 'Y', 'Z', and 'Empty Bags' for the second quarter of 2024-25, both in terms of quantity and value.

(iii)Calculate the budgeted variable cost per unit for producing one bag of product 'X' for the second quarter of 2024-25.

Solution:

(i) Production Budget of 'X' for the Second Quarter

Particulars	**Bags (Nos.)**
Budgeted Sales	1,50,000
Add: Desired Closing stock	33,000
Total Requirements	1,83,000
Less: Opening stock	(45,000)
Required Production	1,38,000

(ii) Raw-Materials Purchase Budget in Quantity as well as in ₹ for 1,38,000 Bags of 'X'

Particulars	**Y Mtr.**	**Z Mtr.**	**Empty Bags Nos.**
Production Requirements Per bag of 'X'	2.5	7.5	1.0
Requirement for Production	3,45,000 (1,38,000 × 2.5)	10,35,000 (1,38.000 × 7.5)	1,38,000 (1,38,000 × 1)
Add: Desired Closing Stock	78,000	1,41,000	84,000
Total Requirements	4,23,000	11,76,000	2,22,000
Less: Opening Stock	(96,000)	(1,71,000)	(1,11,000)

Quantity to be purchased	3,27,000	10,05,000	1,11,000
Cost per mtr./Bag	₹160	₹30	₹120
Cost of Purchase (₹)	5,23,20,000	3,01,50,000	1,33,20,000

(iii) Computation of Budgeted Variable Cost of Production of 1 Bag of 'X'

Particulars	**(₹)**
Raw – Material Y 2.5 mtr @160 Z 7.5 mtr @30 Empty Bag	 400.00 225.00 120.00
Direct Labour (₹70× 9 minutes / 60 minutes)	10.50
Variable Manufacturing Overheads	60.00
Variable Cost of Production per bag	815.50

Illustration 7 :

Budget for the previous two years are as provided below - (in ₹ Lakhs)

Particulars	Year 1 (for 5,000 units)		Year 2 (for 6,000 units)	
Sales		30.00		39.60
Materials	12.50		15.75	
Labour	6.00		7.92	
Overheads (Variable and Fixed)	7.00	25.50	8.70	32.37
Profit		4.50		7.23

- The price increase in Year 2 was driven by inflation, which also impacted the overhead costs.
- The management believes that the increase in sales volume and labour costs in Year 3 will be consistent with the growth experienced in Year 2 compared to Year 1..
- Regarding the increase in sales price and other cost components, two perspectives are being considered: (a) same increase rate will prevail, and (b) increase will be less by 2%.

Prepare the Budgeted Profitability for Year 3, taking both views (a) and (b) above.

Solution:

1. Basic Computations

(a) Sales and Production Quantity Increase from Year 1 to Year 2 = (6,000 - 5,000) units ÷ 5,000 units = 20%.

(b) Sales Price Increase from Year 1 to Year 2 = 39.60 - (30 * 120 %) ÷ (30.00*120%) =10%

(c) Materials Price Increase from Year 1 to Year 2=15.75-(12.50 * 120%) ÷ (12.50*120%) =5%

(d) Labour Rate Increase from Year 1 to Year 2= 7.92 - (6 * 120 %) ÷ (6.00*120%) =10%

(e) OH for Year 2 after 10% increase (i.e. same as Sales Price Increase) = ₹7.00 Lakhs + 10% = ₹7.70 Lakhs. So, change in OH, attributed to increase in quantity between Year 1 to Year 2 =₹8.70 Lakhs - ₹7.70 Lakhs = ₹1.00 Lakh, for 1,000 units. Hence, Variable OH for Year 2 (at the rate of ₹1.00 Lakh for 1,000 units) = ₹6.00 Lakhs. So, Fixed OH for Year 2 = Total OH less Variable OH = ₹8.70 Lakhs - ₹6.00 Lakhs = ₹2.70 Lakhs.

2. Budget for Year 3.

Particulars	**View 1: Same increase** as seen between Year 1 & Year 2	**View 2: Increase less by 2%** except sales Volume and Labour Cost, which is same as previous
Quantity	6,000+ 20% = 7,200 units	6,000+ 20% = 7,200 units
Sales	(39.60/(6000units)*7,200 units)*110%=52.27	(39.60/(6000units)*7,200units)*108%=51.32
Materials	(15.75/(6000units)*7,200 units)*105%=19.85	(15.75/(6000units)*7,200units)*103%=19.47
Labour	(7.92/(6000units)*7,200 units)*110%=10.45	(7.92/(6000units)*7,200units)*110%=10.45
VOH	(6/(6000units)*7,200 units)*110%=7.92	(6/(6000units)*7,200units)*108%=7.78
Fixed OH	2.7 * 110 %=2.97	2.7 * 108 % =2.92
Total Cost	**41.19**	**40.62**
Profit	**11.08**	**10.70**

Illustration 8 :

EKO Company prepared the following budget for a year:

Item	Materials	Labour	Variable Factory OH	Fixed Factory OH	Variable Selling OH	Fixed Selling OH	Profit	Sales Price
Percent	40%	20%	10%	10%	4%	12%	4 %	100%

- After reviewing the half-yearly performance, it was observed that the Company would be able to achieve only 80% of the original budgeted sales.
- Consequently, the revised budgeted sales as envisaged above were estimated at 1,080, reflecting a 10% reduction in the selling price.

Prepare a statement showing the break-up of the original and revised budget for the year.

Solution:

1. Interpretation of percentages given

(a) Revised Budgeted Sales after considering 10% Price Reduction	₹1,080 Lakhs
(b) So, Revised Budgeted Sales before considering Price Reduction= ₹1,080 Lakhs/90%	₹1,200 Lakhs
(c) As expected level is only 80% of the Original Budget, Original Budgeted Sales= ₹1,200 Lakhs / 80%	₹ 1,500 Lakhs

2. Statement showing the break-up of the original and revised budget for a year (Lakhs)

Particulars	**Original Budget**	**Revised Budget**
(a)Sales Revenue (A)	1,500	1,080
(b)Variable Costs:		
Direct Materials	600	40% of ₹1,200 = 480
Direct Labour	300	20% of ₹1,200 = 240
Factory Overheads	150	10% of ₹ 1,200 = 120
Selling & Administration Overheads	60	4% of ₹ 1,200 = 48
Total Varlable Costs (B)	1,110	888
(c) Contribution = (a)-(b)	**390**	**192**
(d) Fixed Overheads: Factory Overheads	150	150
Selling & Administration Overheads	180	180
Total Fixed Overheads (D)	330	330
(e) Profit/Loss (c) - (d)	60	(138)

Note: Sale Prices only have been reduced. Hence costs would be computed in relation to the Original Sale Price

Illustration 9 :

PQR Ltd, over the past few years, has Sales of ₹ 400 Lakhs with 30% Contribution. Last year's Fixed Cost was ₹ 45 Lakhs. The Company plans to venture into new Contract Service Business and also in the process of introduction of a new product.

1. Proposal A: Value of ₹30 Lakhs with Variable Cost 60%, Fixed Cost of ₹5 Lakhs Proposal B: Value of ₹20 Lakhs with Variable Cost 50%, Fixed Cost ₹4 Lakhs
2. New Product: Expected Sales per month ₹6 Lakhs with 50% Variable Cost and Fixed Cost of ₹1.2 Lakhs per month.
3. Optimistic Assumption: Offer for both Contract A & B will mature and be executed next year and new product will be launched from 2nd quarter of next year.
4. Pessimistic Assumption: Only Contract A will mature and be executed next year and New Product will be launched from 4th quarters of next year, and there will be rise in both Variable & Fixed Cost by 10% without scope for rise in Sales Value.

Prepare two Budgets based on Optimistic and Pessimistic Assumptions.

Solution:

1. Budget for next year based on Optimistic Assumption (in ₹ Lakhs):

Activities	Normal Activity	Contract Service	New Product	Total
Revenue	Given = 400.00	30+20 = 50	6 x 9 mths 54.00	504.00
Less: Variable Cost	70% = 280	(30*60%+20*50%)=28.00	50% = 27	335.00
Fixed Cost	Given = 45.00	5+4=9.00	1.2x 9 mths=10.8	64.8
Profit	**75.00**	**13.00**	**16.2**	**104.2**

2. Budget for next year based on Pessimistic Assumption (in ₹. Lakhs):

Activities	**Normal Activity**	**Contract Service**	**New Product**	**Total**
Revenue	Given = 400.00	(A only)= 30	6 x 3 mths 18.00	448.00
Less: Variable Cost	70% = 280	(30*60%)*110%) =19.80	(18*50% +10 %) = 9.90	309.70
Fixed Cost	Given = 45.00	5+10%=5.50	1.2 ×3 mths +10% =3.96	54.46
Profit	**75.00**	**4.7**	**4.14**	**83.84**

Illustration 10 :

XYZ Co. is engaged in the manufacturing of automotive components, which are supplied to a prominent car manufacturer. For the current year, Material Cost per unit is ₹100, Direct Wages ₹40 and Direct Expenses ₹12. The other Information is as follows:

Semi-Variable Cost at different levels of production (₹ Lakhs):

Particulars	16,000 units	20,000 units	24,000 units
Indirect Material	2.00	2.60	3.20
Indirect Wages	1.02	1.50	1.98
Indirect Expenses	0.46	0.50	0.54
Selling Expenses	3.00	4.00	5.00

Fixed Expenses (Depreciation, Maintenance, etc) is ₹5.50 Lakhs per year.

XYZ Co. is currently supplying 20,000 units at a price of ₹250 per unit, with expectations of receiving larger orders at the same price point. The plant has a maximum production capacity of 30,000 units. It has come to an understanding with the Supplier that 1% discount in price (on Present Price) will be available for increase in size by each 5% from the present order. Direct Wages will increase by 5% next year. Moreover, the Fixed Overheads may increase by 5% for each increase in volume of production by 10% or part thereof. The Marketing Department assessed the probabilities of different order size:

Order Size	Probability
20,000	0.35
25,000	0.50
30,000	0.15

Prepare a Budgeted Profitability for the next year on sale based on assessed probability with a comparison with the current year's expected profit.

Solution:

- Effective Order Size next year = (20,000 × 0.35) + (25,000 × 0.50) + (30,000 × 0.15) 25,000 units. So, increase in volume over current year, i.e. from 20,000 to 25,000 units = 25% .
- Material Price will be reduced by 1% for every 5% increase in order quantity, hence 5% decrease in Material Price
- Fixed OH will increase by 5% for each 10% increase in output or part thereof, hence 15% increase in Fixed OH.

Profitability Statement

(₹ Lakhs)

Particulars	1. Same Output 20,000 units	2. Revised Output 25,000 units
1. Sales Value at ₹250 p.u.	20,000 units x 250 = 50.00	25,000 units x 250 = 62.50
2. Direct Costs Materials Labour Direct Expenses	 20,000 units x 100 = 20.00 20,000 units x 40 = 8.00 20,000 units x 12 = 2.40	 25,000 units × (100-5%)=23.75 25,000 units x (40+5%) = 10.50 25,000 units x 12 = 3.00
Total Direct Costs	30.4	37.25
3.Gross Profit	19.6	25.25
4. Indirect Costs: (See WN below)	14.10	**17.575**
5. Profit (3-4)	5.50	7.675

Working Note: Computation of Indirect Costs/Semi-Variable Costs at 24,000 units and 25,000 units level.

Item	For 20,000 units	For 24,000 units	Addnl Cost for 1,000 units	Addni Cost for 1,000 units	Cost for 25,000 units
(a)	(b)	(c)	(d) = (c - b)	(e) = (d) ÷ 4	(f) = (c + e)
Indirect Material	2.60	3.20	0.60	0.15	3.35
Indirect Wages	1.50	1.98	0.48	0.12	2.10
Indirect Expenses	0.50	0.54	0.04	0.01	0.55
Selling Expense	4.0	5.00	1.00	0.25	5.25
Fixed OH	5.50	Not required	-		5.50+15%= 6.325
Total Indirect Costs	**14.10**				**17.575**

Illustration 11 :

In YZA Co., Factory Overheads are applied on the basis of direct labour hours. The following information is given:

	Department A	Department B
Fixed Factory Overheads	₹3,36,000	₹1,26,000
Variable Overheads per labour hour	₹0.50 per hour	₹1.50 per hour
Direct labour Hours required as per Direct Labour Hour budget		
For Product X	₹1,40,000	₹70,000
For Product Y	₹28,000	₹56,000

Prepare the product – wise budget for fixed and variable overheads costs

Solution:

Fixed OH Recovery Rates per hour are computed as under:

Dept A: ₹ 3,36000 ÷ (140000+28000)hours = ₹ 2 per hour

Dept B: ₹ 1,26000 ÷ (70,000+56,000)hours = ₹ 1 per hour

Particulars	Product X	Product Y	Total
1.Deparrtment A:			
(a)Fixed OH at ₹2 per hour	140000*2=₹2,80,000	28000*2=₹56,000	₹3,36,000
(b)Variable OH at ₹0.50 per hour	140000*0.5=₹70,000	28000*0.5=₹14,000	₹84,000
Sub-Total	₹3,50,000	₹70,000	₹4,20,000
2.Deparrtment B:			
(a)Fixed OH at ₹. 1 per hour	70000*1=₹70,000	56,000*1=₹56,000	₹1,26,000
(b)Variable OH at ₹. 1.50 per hour	70000*1.50=₹1,05,000	56,000*1.50=₹84,000	₹1,89,000
Sub-Total	₹1,75,000	₹1,40,000	₹3,15,000
3.Toal Costs: Fixed	₹3,50,000	₹1,12,000	₹4,62,000
Variable	₹1,75,000	₹98,000	₹2,73,000
Sub-Total	₹5,25,000	₹2,10,000	₹7,35,000

7 Divisional Performance Measurement [Study Material - Module 8]

Illustration 1 :

JR Electronics Ltd. has an investment centre that reported operating profits of $40 million. This was after charging $8 million for the research and development (R&D) costs for a new product that is expected to generate profits for Six years. Taxation is paid at the rate of 18 % of the operating profit.

The company has a risk adjusted weighted average cost of capital is (WACC) is 11% per annum, and the company is paying interest at 7% per annum on a substantial long term loan.

The investment center's non-current asset value is $90 million and the net current assets have a value of $30 million. The replacement cost of the non-current assets is estimated to be $100 million.

Required:

Calculate the investment center's EVA for the period.

Solution :

Calculation of NOPAT	**$ (million)**
Operating profit	40
Add : R&D cost	8
Less: one year's amortization of R&D cost ($8m/6)	(1.33)
Taxation at 18%	(8.40)
NOPAT	38.27
Calculation of economic value of net assets	**$m**
Replacement cost of net assets ($30m + $100m)	130
Economic value of net assets = development cost	6.67
	136.67

Calculation of EVA

The capital charge is based on the WACC, which takes into account of the cost of share capital as well as the cost of loan capital. Therefore the correct interest rate is 11%.

	$m
NOPAT	38.27
Less: Capital charge (11% × $136.67m)	15.03
EVA	23.24

The investment center's EVA for the period is $23.24 million.

Illustration 2 :

A division with capital employed of $500,000 currently earns an ROI of 18%. It can make an additional investment of $75,000 for a five-year life with nil residual value. The average net profit from this investment would be $15,000 after depreciation. The division's cost of capital is 12%.

What are the residual incomes before and after the investment?

Solution :

	Before investment	**After investment**
	$	**$**
Divisional profit ($500,000 × 18%) ($575,000 × 18%)	90,000	 1,03,50
Imputed interest ($5, 00,000 × 12%) ($5,75,000 × 12%)	60,000	 69,000
Residual income	30,000	34,500

Illustration 3 :

The Surya Ltd. is segmented into two divisions, Finance and Marketing .The company is evaluating the performance of both divisions based on Return on Investment (ROI) and Residual Income (RI). The selected financial data for both divisions are as follows:

Division	**Finance**	**Marketing**
ROI	18%	22%
Income	₹ 18,00,000	₹ 13,20,000
Investment Base	₹ 1,00,00,000	₹ 60,00,000
Capital Charge (at 15%)	₹ 15,00,000	₹ 9,00,000
Capital Charge (at 10%)	₹ 10,00,000	₹ 6,00,000

Required:

1. Calculate the ROI for both divisions.
2. Calculate the Residual Income (RI) for both divisions at 15% and 10% capital charge rates.
3. Interpret the results and evaluate the performance of the two divisions.

Solution :

1. Calculation of ROI

	Division	
	Finance	Marketing
ROI =	$\frac{\text{EBIT}}{\text{Investment base}} \times 100$	$\frac{\text{EBIT}}{\text{Investment base}} \times 100$
=	$\frac{18,00,000}{1,00,00,000} \times 100$	$\frac{13,20,000}{60,00,000} \times 100$
	18%	22%

2. Calculation of Residual Income (RI) at 15% Capital Charge

RI =	Income - (Capital charge× Investment base)	Income - (Capital charge× Investment base)
	= ₹18, 00,000 - (15% × ₹1, 00, 00,000)	₹13, 20,000 - (15% ₹ 60, 00,000)
	= ₹ 18,00,000 - ₹ 15,00,000	₹ 13,20,000 - ₹ 9,00,000
	= ₹ 3, 00,000	₹ 4, 20,000

3. Calculation of Residual Income (RI) at 10% Capital Charge

RI =	₹18, 00,000 - (10% × ₹1, 00, 00,000)	₹13, 20,000 - (10% ₹60,00,000)
	= ₹18,00,000 - ₹10,00,000	₹13,20,000 - ₹6,00,000
	= ₹8, 00,000	₹7,20,000

4. Interpretation

ROI Results:

- Interior Division has an ROI of 18%.
- Exterior Division has a higher ROI of 22%.

Both divisions show positive ROI, but Exterior Division is more efficient at generating returns from its investment, with an ROI of 22% compared to 18% for Interior Division.

Residual Income (RI) Results:

At 15% Capital Charge:

- Interior Division has a positive residual income of ₹3,00,000, indicating that the division is generating income above the required return on investment.
- Exterior Division has a higher residual income of ₹4,20,000, which shows it is also creating more value above its required return compared to the Interior Division.

At 10% Capital Charge:

- Interior Division performs better with a residual income of ₹8,00,000, which is significantly higher than its residual income at 15%.
- Exterior Division also sees an increase in residual income to ₹7,20,000, but the difference between the two divisions becomes smaller.

Illustration 4 :

Division A of PQR Co. Ltd. has currently a net income of Rs, 5,00,000 p.a. generated from an investment of ₹25,00,000. The company requires a minimum return of 14%. A new project is being considered by division manager of A which will entail investment of ₹3,00,000 and will yield annual net income of ₹45,000.

Evaluate the project using - (a) ROI and (b) Residual income.

Solution :

(a) ROI method –

	Existing	On acceptance of the project
Net income	₹ 5, 00,000	₹ 5, 45,000
Investment	₹ 25, 00,000	₹ 28,00,000
ROI	20%	19.46%

This project may be discarded as XYZ Ltd.'s ROI falls from 20% to 19.46%

(b) Residual income method –

Net income	₹ 5,00,000	₹ 5,45,000
Less: Imputed interest		
(14% of ₹25,00,000)	3,50,000	
(14 % of ₹28,00,000)		3,92,000
Residual Income	1,50,000	1,53,000

This project may be accepted as the residual income has increased by ₹3,000.

Illustration 5 :

The Income Statement and Balance Sheet of Beta Company Ltd is given below :

Particulars	₹ (in lakhs)	₹ (in lakhs)
Sales	5,500	
Interest on Investment	120	
Profit on sale of old assets	60	
Total Income		5,680
Less:		
Manufacturing Cost	2000	
Administration Cost	650	
Selling and distribution Cost	550	
Depreciation	350	
Loss on sale of an old Building	60	3610
EBIT		2,070
Less: Interest		220
EBT		1,850
Less: Tax @ 30%		555
PAT		1,295
EPS		₹ 25.90
P/E ratio		3.0

Balance Sheet

Liabilities	₹	Assests	₹
Equity Capital (₹10)	600	Buildings	900
Retained Profits	500	Machinery	800
Term Loan	700	Stock	200
Payables	200	Debtors	170
Provisions	150	Bank	80
TOTAL	**2,150**	**Total**	**2,150**

The cost of equity and cost of debt is 15% and 9% respectively. The company pays 30% corporate tax.

From the information given you are required to calculate the EVA. Also, calculate MVA on the basis of market value of Equity capital.

Solution :

$$\begin{aligned} EVA &= NOPAT - (WACC \times CE) \\ &= 1449 - (11.617\% \times 1800) \\ &= 1239.89 \end{aligned}$$

Calculation of NOPAT

Particulars	Amount
EBIT	2,070
(-) Tax @ 30%	621
NOPAT	1,449

Calculation of WACC

Sources	Amt	Proportion	Cost	WACC
Equity Capital	600	33.33	15%	5.00%
Retained	500	27.78	15%	4.167%
Term Loan	700	38.89	6.3%	2.45%

Kd = I (1-tax)

= 9 (1-0.30)

= 6.3

Calculation of MVA

MVA = Market Capitalization – Book value of Net Worth

= 4662 – 1100

= 3562

Market Capitalization = MPS × No of Shares

= 77.7 × 60

= 4662

$$\text{P/E ratio} = \frac{\text{MPS}}{\text{EPS}}$$

$$3.00 = \frac{\text{MPS}}{25.90}$$

MPS = 3 × 25.90

MPS = 77.7

Note : Cost of Retained Earning = Cost of Equity

Illustration 6 :

Compute EVA of RPCL Ltd. For 3 years from the information given - (in ₹ Lakhs)

Year	1	2	3
Average Capital Employed	3,200.00	3,800.00	4,500.00
Operating Profit before Interest	900.00	1,300.00	1,750.00
Corporate Income Taxes	90.00	100.00	130.0
Average Debt/ Total Capital Employed (in%)	45.00	40.00	15.00
Beta variant	1.15	1.25	1.35
Risk Free Rate (9%)	10.00	10.00	10.00
Equity Risk Premium (%)	12.00	12.00	12.00
Cost of Debt (Post Tax) (%)	18.00	18.00	19.00

Solution :

Particulars	Y1	Y2	Y3
EVA = NOPAT-(WACC x CE)	= 810 – (3,200x21.19%) = ₹ 131.92	1200 - (3,800 x22.20%) = ₹ 356.4	1620 - (4500 x 25.12%) = ₹ 489.60
(i)Calculation of NOPAT:			
EBIT	900	1300	1,750
-Tax	90	100	130
NOPAT	810	1,200	1,620
(iii) Calculation of WACC:			
WACC for debt			
Proportion	45	40	15
Cost	18%	18%	19%
(A)	8.1%	7.2%	2.85%
WACC for Equity			
Proportion	55	60	85
Cost	23.8%	25.00%	26.20%
(B)	13.09%	15.00	22.27
(A+B) Total WACC	21.19%	22.20	25.12
(vii) CE (Capital Employed)	3,200	3,800	4,500

ke (Y_1) = Rf + B (Rm - Rf)

= 10.00 + 1.15 (12)

= 10.00 + 13.8

= 23.8

ke (1/2) = Rf + B (Rm - Rf)
= 10.00 + 1.25 (12)
= 10.00 + 15
= 25.00

ke (1/3) = Rf + B (Rm - Rf)
= 10.00 + 1.35 (12)
= 10.00 + 16.20
= 26.20

Illustration 7 :

RADIANCE MOTORS LTD. manufactures engines mounting for Sky-jet airline. They have been asked to bid on a prospective contract for 30 engines mounting for the Jet aircraft. They have just completed and initial run of 10 of these mounting at the following costs:

Particulars	Amount in (₹)
Direct materials	8,400
Direct labour (2400 hours @ 5)	12,000
Variable overhead (0.60 per labour hour)	1,440
Fixed overhead (1 per labour hour)	2,400
	24,240

An 80% learning curve is thought to be pertinent in this case. Marketing Director believes that the quotation is unlikely to be accepted if it exceeds 48,000 and as the company are short of work, he believes the contract to be vital.

You are required to comment whether it is worth accepting at 48,000.

Solution :

Labour hours required:

	Cumulative quantity manufactured	Cumulative hours	Cumulative average hours per unit (Engine)
(i)	10	2,400	2400 /10 = 240
(ii)	20	3,840	240 x 0.80 = 192
(iii)	40	6144	192 x 0.80 = 153.6

Additional hour for 30 = Hours Required for 40 engines minus hours, required original 10 units (engines) for which initial run has already been completed.

= 6144 - 2400 = 3744 hours

Incremental Costs for 30 engines will be :

Particulars	₹
Direct materials	25,200
Direct labour	18,720
Variable overhead (3744 × 0.60)	2,246.4
Fixed overhead	-----
	₹46,166.4

Comments:

The contract is worth accepting, if more profitable work is not being turned away, as it yields a contribution of only ₹1833.6 (i.e. ₹ 48,000 – 46,166.4)

Illustration 8 :

KG Limited has three autonomous divisions. The divisions are evaluated on the basis of ROI, with year end bonuses given to divisional managers who have the highest ROI. Operating results of Division Il for the last year are given below:

	₹
Sales	2, 10, 00,000
Less: Variable Expenses	1, 26, 00,000
Contribution margin	84, 00,000
Less: Fixed Expenses	67, 20,000
Net Operating Income	16,80,000
Divisional operating assets	52, 50,000

The company's overall ROI for the last year was 18% (considering all divisions). Division II has an opportunity to add a new product line that would require an investment of ₹30,00,000. Other details of the new product line are as follows:

Sales	₹ 90, 00,000 per annum
Variable Expenses	65% of sales
Fixed Expenses	₹ 25, 20,000 per annum
Life cycle of the product line	5 years

Though Division Il is performing well, but many a times, the customers omplained that they had to wait for long after placing the orde`. The company is interested in cutting the amount of time between when a customer places an order and when the order is completed. For the last year, the following data were reported in respect of Division II

Inspection time	= 0.5 days per batch
Process time	= 2.8 days per batch
Wait time	= 16.0 days per batch
Queue time	= 4.0 days per batch
Move time	= 0.7 days per batch

In addition to financial performance measures, the company wishes to introduce a variety of non-financial performance measures. The company has set aggressive targets in both sales growth and ROI for the coming year. The company's strategy for achieving these goals includes a campaign aimed at building brand recognition, customer retention, improvement in product quality, on time delivery to customers, expansion of eco-friendly product line and introduction of limited edition items.

Required:

(i) Calculate last year's ROI of Division II

(ii) Discuss whether the manager of Division lI would accept or reject the new product line, if he takes his decision based solely on divisional ROI.

(iii) Advise how residual income approach can be used as an alternative financial measure for evaluation of managerial performance in the best interest of the company.

(iv) Calculate Manufacturing Cycle Efficiency (MCE) and interpret the result.

(v) State what percentage of the production time is spent in non-value added activities.

(vi) Calculate the delivery cycle time.

(vii) Calculate the new MCE if by using Lean Production all queue time can be eliminated.

Solution :

(i) Last year's ROl of Division II:

$$= \frac{\text{Net operating income}}{\text{Divisional Oerating Assets}}$$

$$= \frac{₹16,80,000}{₹52,50,000}$$

ROI = 32%

(ii) Calculation of ROl of new product line:

	₹
Sales	90,00,000
Less: Variable Expenses	58,50,000
Contribution	31,50,000
Less: Fixed Expenses	25,20,000
Operating Income (Net)	6,30,000
Investment	30,00,000
New product line ROI (%)	21%

The manager of Division Il should reject the new product line as ROI of new product line i.e. 21% is less than last year ROl of Division Il i.e. 32%.

(iii) To overcome some of the dysfunctional consequences of ROI, the residual income approach can be used. For the purpose of evaluating the performance of divisional managers, residual income is defined as controllable contribution less a cost of capital charge on the investment controllable by the divisional manager. For evaluating the economic performance of the division residual income can be defined divisional contribution less a cost of capital charge on the total investment in assets employed by the division. If residual income is used to measure the managerial performance of investment centres, there is a greater probability that managers will be encouraged, when acting in their own best interests, also to act in the best interests of the company.

Here, the AKG Limited should follow the residual income approach, as considering the following:

Proposed Investment	=	₹ 30, 00,000
Controllable Contribution	=	₹ 31, 50,000
Cost of Capital (21%)	=	₹ 6, 30,000
Residual Income	=	₹ 25, 20,000

(iv) Manufacturing Cycle Efficiency

$$= \frac{\text{Processing Time}}{\text{Processing Time–Inspection Time +Waiting Time–Move Time Queue Time}}$$

$$= \frac{2.8}{2.8+0.5+16+0.7+4}$$

$$= \frac{2.8}{24} \times 100$$

$$= 11.67\%$$

(v) Non-Value added Activities

= Inspection Time + Waiting Time + Move Time + Queue Time

= 0.5 days + 16 days + 0.7 days +4 days

= 21.2 days

Total Production Time = 0.5 +2.8 + 16 +4+ 0.7

= 24 days

% $= \frac{21.2}{24} \times 100$

% of production time spent on non-value added activities = 88.33%

(vi) Delivery Time Cycle = Inspection Time + Processing Time + Wait Time + Queue Time + Move Time

= 0.5 days +2.8 days + 16 days +4 days + 0.7 days = 24 days

(vii) MCE if Queue time is eliminated

$$= \frac{2.8}{2.8+0.5+16+0.7+4} = 14\%$$

Illustration 9 :

SPECTRA LTD., a manufacturing company received an order for 16 units of a new product. So far, 4 units have been completed; the first unit required 40 direct labour hours and a total of 102.40 direct labour hours has been recorded for the 4 units. The Production Manager expects on 85% learning effect for this type of work.

The direct cost attributed to the centre in which the unit is manufactured and its costs are as follows:

Particulars	₹
Direct Material	30.00 per unit
Direct Labour	6.00 per hour
Variable overhead	0.50 per direct labour hour
Fixed overheads apportioned	5.00 per direct labour hour

You are required to produce an estimated product cost for the initial order based on the cost data given.

Solution :

80% learning curve results are given below :

Production (units)	**Cumulative Avg. time (hours)**	**Total time (hours)**
1	40	40
2	34 (0.85 x 40)	68
4	28.9 (0.85 x 34)	115.6
8	24.57 (0.85 x 28.9)	196.56
16	20.88 (0.85 x 24.57)	334.08
32	17.75 (0.85 x 20.88)	568.00

Computation of total cost for the initial order of 16 units:

	₹
Material (30 x 16)	480.00
Direct labour (334.08 x 6)	2004.48
Variable overheads (334.08 x 0.50)	167.04
Fixed overhead apportioned (5 x 334.08)	1670.4
Total Cost	**4321.92**

Illustration 10 :

The following information is given for three companies that are identical except for their capital structure:

Particulars	White	Green	Yellow
Total Invested Capital	1,00,000	1,00,000	1,00,000
Debt/Assets Ratio	0.8	0.5	0.2
Shares Outstanding	6,100	8,300	10,000
Pre Tax Cost of Debt	16%	13%	15%
Cost of Equity	26%	22%	20%
Operating Income (EBIT)	25,000	25,000	25,000
Net Income	**8,970**	**12,350**	**14,950**

The tax is uniform 35% in all cases.

(i) Compute the weighted average cost of capital for each company.

(ii) Compute the Economic Value Added (EVA) for each company.

(iii) Based on the EVA, which company would be considered for best investment?

(iv) If the industry P/E ratio is 11 times, estimate the price for the share of each company.

(v) Calculate the estimated market capitalization for each of the Companies.

Solution :

		White	Green	Yellow
(i)	W/d (Debt Assets Ratio)	0.8	0.5	0.2
	Kd (Cost of Debt) (%)(after tax)	10.4	8.45	9.75
	We (Weight of Equity)	0.2	0.5	0.8
	Ke (Cost of Equity) %	26	22	30
	WACC %	13.52	15.225	17.95
(ii)	Invested Capital	1,00,000	1,00,000	1,00,000
	EBIT	25,000	25,000	25,000
	NOPAT	16,250	16,250	16,250
	EVA (Economic Value Added)	2,730	1,025	-1,700
	(NOPAT-WACC x Invested capital			
(iii)	Best Company	White		
	White company would be considered for best investment since the EVA/Performance metric of the Company is highest and its weighted average cost of capital is the lowest.			
		White	Green	Yellow
(iv)	Shares (Nos.)	6,100	8,300	10,000
	Net Income	8,970	12,350	14,950
	EPS	1.47	1.49	1.50
	Price (P/E = 11)	16.17	16.39	16.50
(v)	Market Capitalization (No. of shares x price)	98,637	1,36,037	1,65,000

8 Responsibility Accounting [Study Material - Module 9]

Illustration 1 :

KINO Airlines has two divisions organized as profit centres, the Passenger Division and the Cargo Division. The following divisional information were given for the year ended 31 March 2024:

	Cargo Division	Passenger Division	Total
Number of personnel trained	200	800	1000
Number of flights	350	250	600
Number of reservations requested	Nil	7000	7000
Revenue	₹42,00,000	₹42,00,00	₹84,00,000
Operating Expenses (excluding service department charges)	₹36,00,000	₹28,50,000	₹64,50,000
Service Department Charges			
Training	₹3,20,000	₹3,20,000	₹6,40,000
Flight Scheduling	₹3,00,000	₹3,00,000	₹6,00,000
Reservation	₹1,05,000	₹1,05,000	₹2,10,000

The service department charge rate for the service department costs was based on revenue. Since the revenue of both the divisions was the same, the service department charges to each to division were also the same.

Required:

(i) Does the income from operations for the two divisions accurately measure performance?

(ii) Prepare the divisional income statement using activity bases provided above in revising the service department charges.

Solution :

(i) The reported income from operations does not accurately measure performance because the service department charges are based on revenue. Revenue is not associated with the profit centre manager's use of the service department services. For example, the Reservations Department serves only the Passenger Division and number of reservation requested by Cargo Division is NIL. Thus, by charging this cost based on revenue, these costs are incorrectly

charged to the Cargo Division. Further, the Passenger Division requires additional personnel. Since these personnel must be trained, the training costs assigned to the Passenger Division should be greater than the Cargo Division.

(ii)KINO Airlines

Divisional Income Statement
For the Year Ended March 31, 2024

Particulars	Cargo Division (₹)	Passenger Division (₹)	Total (₹)
Revenue	42,00,000	42,00,000	84,00,000
Less: Operating Expenses (excluding service department charges)	36,00,000	28,50,000	64,50,000
Gross Margin	6,00,000	13,50,000	19,50,000
Less: Service Department Charges			
Training	1,28,000 [(200 ÷1,000) ×₹6,40,000]	5,12,000 [(800 ÷1,000) ×₹6,40,000]	6,40,000
Flight Scheduling	3,50,000 [(350÷600) ×₹6,00,000]	2,50,000 [(250÷600) ×₹6,00,000]	6,00,000
Reservation	NIL	2,10,000 [(7000÷7000) × 2,10,000] 2,10,0000,000	2,10,000
Operating Income	2,97,000	5,03,000	8,00,000

Illustration 2 :

The following information pertains to M & Co. for the previous year:

M & Co. produced 1,200 units and sold 1,000 units, as planned. There were no beginning or ending work-in-process and no beginning finished goods inventory. Both budgeted and actual fixed costs were the same. All variable manufacturing costs were influenced solely by production volume, and all variable selling costs were influenced only by sales volume.

The budgeted per-unit revenues and costs are as follows:

- Sales price: ₹120
- Direct materials: ₹35
- Direct labour: ₹25
- Other variable manufacturing costs: ₹12
- Fixed manufacturing costs: ₹6

- Variable selling costs: ₹15
- Fixed selling costs (₹4,800 total): ₹4
- Fixed administrative costs (₹24,000 total): ₹3

Calculate the contribution margin earned by M & Co. for the prior year.

Solution :

The contribution margin per unit is calculated by subtracting the variable costs from the sales price.

Sales Price per unit: ₹120

Variable Costs per unit:

- Direct materials: ₹35
- Direct labour: ₹25
- Other variable manufacturing costs: ₹12
- Variable selling costs: ₹15

Total variable costs per unit:

Total variable costs per unit = 35+25+12+15 = 87

Contribution Margin per unit:

Contribution Margin per unit = Sales Price − Total Variable Costs = 120−87 = 33

Total Contribution Margin = Contribution Margin per unit×Units Sold = 33×1000 = 33,000, The total contribution margin earned by M & Co. for the prior year is ₹33,000

Illustration 3 :

A company has three departments: Production, Sales, and Distribution. The following budgeted and actual figures for the month of January are provided:

Department	Budgeted Costs	Actual Costs
Production	₹50,000	₹52,000
Sales	₹30,000	₹32,000
Distribution	₹20,000	₹18,000

Calculate the responsibility accounting variances for each department.

Solution :

1. Production Department:
   - Budgeted Costs = 50,000
   - Actual Costs = ₹52,000
   - Cost Variance = Actual Costs - Budgeted Costs
     = ₹52,000 - ₹50,000 = ₹2,000 (Unfavourable)

   So, the Production Department has an Unfavourable cost variance of ₹2,000.

2. Sales Department:
   - Budgeted Costs = ₹30,000
   - Actual Costs = ₹32,000
   - Cost Variance = Actual Costs - Budgeted Costs
     = ₹32,000 - ₹30,000 = ₹2,000 (Unfavourable)

   So, the Sales Department has an Unfavourable cost variance of ₹2,000.

3. Distribution Department:
   - Budgeted Costs = ₹20,000
   - Actual Costs = ₹18,000
   - Cost Variance = Actual Costs - Budgeted Costs
     = ₹18,000 - ₹20,000 = (₹2,000) (Favourable)

   So, the Distribution Department has a Favourable cost variance of ₹2,000.

Summary of Variances:

Department	Budgeted Costs	Actual Costs	Cost Variance	Favourable/Unfavourable
Production	₹50,000	₹52,000	₹2,000(Unfavourable)	Unfavourable
Sales	₹30,000	₹32,000	₹2,000(Unfavourable)	Unfavourable
Distribution	₹20,000	₹18,000	₹2,000 (Favourable)	Favourable

This concludes the responsibility accounting analysis for the month of January.

Illustration 4 :

PQR Ltd. operates in a multi-department environment and uses responsibility accounting to evaluate performance. The company has the following departments: Production, Sales, and Distribution. The budgeted and actual performance for the month of April is provided below:

Department	Budgeted Sales	Actual Sales	Budgeted Variable Costs	Actual Variable Costs	Budgeted Fixed Costs	Actual Fixed Costs
Production	₹4,00,000	₹3,80,000	₹2,40,000	₹2,45,000	₹50,000	₹50,000
Sales	₹4,50,000	₹4,60,000	₹1,50,000	₹1,45,000	₹30,000	₹32,000
Distribution	₹3,50,000	₹3,40,000	₹1,00,000	₹95,000	₹40,000	₹42,000

Required:

1. Calculate the contribution margin earned by the company for the month of April.
2. Break down the contribution margin for each department.

Solution :

Step 1: Calculate the Contribution Margin for Each Department

The Contribution Margin (CM) for a department is calculated as:

Contribution Margin = Sales − Variable Costs

1. Production Department:
   - Budgeted Sales = ₹400,000
   - Actual Sales = ₹380,000
   - Budgeted Variable Costs = ₹240,000
   - Actual Variable Costs = ₹245,000

   Budgeted Contribution Margin (Production):

   Budgeted CM=Budgeted Sales−Budgeted Variable Costs=400,000−240,000= ₹160,000

   Actual Contribution Margin (Production):

   Actual CM=Actual Sales−Actual Variable Costs=380,000−245,000=₹135,000
2. Sales Department:
   - Budgeted Sales = ₹450,000
   - Actual Sales = ₹460,000
   - Budgeted Variable Costs = ₹150,000
   - Actual Variable Costs = ₹145,000

   Budgeted Contribution Margin (Sales):

   Budgeted CM=Budgeted Sales−Budgeted Variable Costs=450,000−150,000=₹300,000

   Actual Contribution Margin (Sales):

   Actual CM=Actual Sales−Actual Variable Costs=460,000−145,000 = ₹315,000
3. Distribution Department:
   - Budgeted Sales = ₹350,000
   - Actual Sales = ₹340,000

- Budgeted Variable Costs = ₹100,000
- Actual Variable Costs = ₹95,000

Budgeted Contribution Margin (Distribution):

Budgeted CM=Budgeted Sales−Budgeted Variable Costs=350,000−100,000=₹250,000

Actual Contribution Margin (Distribution):

Actual CM=Actual Sales−Actual Variable Costs=340,000−95,000=₹245,000

Step 2: Calculate the Total Contribution Margin for the Company

- Total Budgeted Contribution Margin:
  Total Budgeted CM=160,000+300,000+250,000=₹710,000
- Total Actual Contribution Margin:
  Total Actual CM=135,000+315,000+245,000=₹695,000

Step 3: Calculate the Contribution Margin Variance

The contribution margin variance is the difference between the actual contribution margin and the budgeted contribution margin.

Contribution Margin Variance=Total Actual CM−Total Budgeted

CM=695,000−710,000=₹15,000 (Unfavourable)

So, the company has an Unfavourable contribution margin variance of ₹15,000.

Step 4: Analyze the Contribution Margin Variance by Department

To evaluate the performance of each department, let's calculate the contribution margin variance at the department level.

1. Production Department:
   Production CM Variance=Actual CM (Production)−Budgeted CM (Production)=135,000−160,000=₹25,000 (Unfavourable)
2. Sales Department:
   Sales CM Variance=Actual CM (Sales)−Budgeted CM (Sales)=315,000−300,000=₹15,000 (Favourable)
3. Distribution Department:
   Distribution CM Variance=Actual CM (Distribution)−Budgeted CM (Distribution)=245,000−250,000=₹5,000 (Unfavourable)

Notes:

Notes:

The Institute of Cost Accountants of India

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