ACTIVITY BASED COST MANAGEMENT

Q.5   Having attended a CIMA course ….
Solution

(a)   Overheads absorbed on machine hour basis
Machine hour absorption rate = Total overheads / Total machine hours

$$= \frac{10,430+5,520+3,600+2,100+4,620}{(120 \times 4)+(100 \times 3)+(80 \times 2)+(120 \times 3)}$$

$$= \frac{26,000}{1,300} = 20 \text{ per machine hour}$$

Total costs based on machine hour basis

	A	B	C	D
Direct materials	40	50	30	60
Direct labour	28	21	14	21
Production overhead	80	60	40	60
Production cost/unit	**148**	**131**	**84**	**141**
Output in units	120	100	80	120
Total production cost	**17,760**	**13,100**	**6,720**	**16,920**

(b)   Overheads absorbed based on ABC

	Overhead costs	Level of activity	Level of activity
Machine department cost	10,430	1,300	8.02/hour
Set-up costs	5,250	21*	250.00/run
Stores receiving costs	3,600	80 **	45.00/requisition
Inspection/quality costs	2,100	21*	100.00/run
Material handling and despatch	4,620	42	110.00/order

Workings

*No. of production runs   = Output in Units / 20

$$= \frac{120+100+80+120}{20}$$

$$= \frac{420}{20} = 21$$

*No. of requisitions raised   = No. of Products X 20
                                 = 4 x 20 = 80

Total costs based on ABC

	A	B	C	D
Direct materials	40.00	50.00	30.00	60.00
Direct labour	28.00	21.00	14.00	21.00
Direct labour	32.09	24.07	16.05	24.07
Set-up costs	12.50	12.50	12.50	12.50
Stores receiving	7.50	9.00	11.25	7.50
Inspection	5.00	5.00	5.00	5.00
Material handling	11.00	11.00	11.00	11.00
Production cost/unit	**136.09**	**132.57**	**99.80**	**141.07**
Output in units	120	100	80	120
Total production costs	**16,331**	**13,257**	**7,984**	**16,928**

(c) Comparison of the two unit costs calculated in (a) and (b) above.

Product	A	B	C	D
Based on machine hour rate	148.00	131.00	84.00	141.00
ABC method	136.09	132.57	99.80	141.07
Difference	**11.91**	**(1.57)**	**(15.80)**	**(0.07)**
	Over costed	**Under costed**	**Under costed**	**Fairly costed**

Products A and C have the largest differences. It may be observed that Product A is over-costed whereas Product C is under-costed under traditional costing.

This under/ over costing is due to the disproportionate consumption of resources in comparison to No. of Machine Hours. The ABC approach in theory, attributes the cost of resources to each product which uses those resources on a more appropriate basis than the traditional method.

Other things being constant Product A will be Overpriced and Product C will be Underpriced. Mispricing results in adverse implication of profit because when Product is overpriced then quantity sold will be less than optimal and when underpriced the profit margin would be less than the optimal.

The implication is that product A is more profitable than the traditional approach implies, whereas C is less profitable. If selling prices were determined on costs based on the traditional absorption method, the organisation might consider increasing the price of C and reducing that of A.

Q.7   A bank offers three products viz., deposits…….
Solution
(a)   **Budget Cost Statement**

Activity	Activity Cost (Rs.) (Budgeted)	Activity Driver	No. of Units of Activity Driver (Budget)	Activity Rate (Rs.)	Deposits	Loans	Credit Cards
1. ATM Services	8,00,000	ATM Transaction	2,00,000	4	6,00,000	-	2,00,000
2. Computer Processing	10,00,000	Computer Transaction	20,00,000	0.50	7,50,000	1,00,000	1,50,000
3. Issuing Statements	20,00,000	No. of Statements	5,00,000	4.00	14,00,000	2,00,000	4,00,000
4. Customer Inquiries	3,60,000	Telephone Minutes	7,20,000	0.50	1,80,000	90,000	90,000
Budgeted Cost	41,60,000				29,30,000	3,90,000	8,40,000
Units of product as estimated in the budget period					58,600	13,000	14,000
Budgeted Cost per unit of the product					50	30	60

Working Notes:

(i)   ATM $4,00,000 + 2,00,000 + 2 \times 1,00,000$ = 8,00,000
(ii)   Computer   5,00,000 (Fixed = 2,50,000) Variable   = 10,00,000
                             2,50,000 increase to 3 times = 7,50,000
(iii) Issuing Statements $2,00,000 + 80\% \times 2,00,000 = 2 + 1.6$ = 3,60,000.

Q.8   DEF Bank operated for years under…..
Solution
            Calculation showing Rates for each Activity & Cost of each Product

Activity	Cost Driver Rates	Checking Accounts	Personal Loans	Gold Visa
Providing ATM Service	$\frac{₹1,00,000}{2,00,000} = 0.50$ per transaction	$1,80,000 \times 0.50$ = 90,000	-	$20,000 \times 0.50$ = 10,000
Computer Processing	$\frac{₹1,00,000}{2,00,000} = 0.40$ per transaction	$20,00,000 \times 0.40$ = 8,00,000	$2,00,000 \times 0.40$ = 80,000	$3,00,000 \times 0.40$ = 1,20,000
Issuing Statements	$\frac{₹1,00,000}{2,00,000} = 1.60$ per statement	$3,00,000 \times 1.60$ = 4,80,000	$50,000 \times 1.60$ = 80,000	$1,50,000 \times 1.60$ = 2,40,000
Customer Services	$\frac{₹1,00,000}{2,00,000} = 0.60$ per telephone minute	$3,50,000 \times 0.60$ = 2,10,000	$90,000 \times 0.6$ = 54,000	$1,60,000 \times 0.60$ = 96,000
Total Cost		15,80,000	2,14,000	4,66,000
Units of Product		30,000	5,000	10,000
Cost per unit		52.67	42.80	46.60

Q.9   IBM Ltd manufactures …..

Solution

Statement showing manufacturing cost

		P1 ₹/unit		P2 ₹/unit
Direct Material Cost		407.50		292.10
Overhead:				
Material handling	84×1.20	100.80	46×1.20	55.20
Assembly Management	3.2×40.00	128.00	1.9×40.00	76.00
Machine insertion	48×0.70	33.60	31×0.70	21.70
Manual insertion	36×2.10	75.60	15×2.10	31.50
Quality testing	1.4x25	35.00	1.1x25	27.50
Present cost		780.50		504.00
Target cost		680		390

		Revised P1 ₹/unit		Revised P2 ₹/unit
Direct Material Cost		381.20		263.10
Overhead:				
Material handling	71×1.20	85.20	39×1.20	46.80
Assembly Management	2.1×40.00	84.00	1.6×40.00	64.00
Machine insertion	59×0.70	41.30	29×0.70	20.30
Manual insertion	12×2.10	25.20	10×2.10	21.00
Quality testing	1.2x25	30.00	0.9x25	22.50
Present cost		646.90		437.70
Target cost		680		390
		Achieved		Not achieved

		Revised P1 ₹/unit		Revised P2 ₹/unit
Total Cost per unit (as Calculated above)		646.90		437.70
Less:				
Reduction in Assembly Management Cost	(40-28)x2.1	25.20	(40-28)×1.60	19.20
Revised Present cost		621.70		418.50
Target cost		680		390
		Achieved		Still Not achieved

Q.10   ABC Electronics makes ……..

Solution

(i)   Calculation of cost of product:

	Particular	AB 100	AB 200
1.	Direct Material cost	₹1000	₹800 [1000-200]
2.	Direct labour cost	₹200	180 [200-20]
3.	Machining cost	₹200	₹160 [(1hr-20%)x200]
4.	Tasting cost	₹250	₹200 [(2hrs-20%)x125]
5.	Rework cost	₹150 (15 lakhs/10000 units)	₹75 [5% x 10000 units x ₹1500 = 750000/10000 units]
6.	Ordering cost	₹2	₹1.25 [50 components x 2 orders – 100 orders x 125 = 12500/10000 units]
7.	Engineering cost	₹198	₹198
	Total cost	2000	1614.25

(ii)   Effect on operating income:

Particular	AB 100	AB 200
Sales price	3000	2600
(-) cost price	(2000)	(1614.25)
Margin per unit	1000	985.75

Reduction in margin per unit   =   14.25
X no. of units   =   1000 Units Per Month
Reduction in operating income =   ₹ 1,42,500 Per Month

Q.11   Life's Good Electronics…..

Solution

Calculation of ABC Recovery Rates

Activities	Cost Rs.	Units of Cost Driver	Cost Driver Rate
Product Design	20,00,000	8,000 Design Hours	₹250 per design hour
Purchasing	2,00,000	4,000 Purchase Orders	₹50 per purchase order
Production (excluding deprn)	12,00,000	12,000 Machine Hours	₹100 per machine hour
Packing	4,00,000	20,000 cu.m.	₹20 per cu.m.
Distribution	6,00,000	1,20,000 kg	₹5 per kg.

Computation of OH Cost of New Product

Particulars	Computation	₹ Per Unit
Product Design	(400 Design Hours x ₹ 250 per hour) ÷ 5000 units	20.00
Purchasing	(5 Orders x ₹ 50 per Order) ÷ 250 Units	1.00
Production (excluding depn)	(0.75 machine hours x ₹ 100 per hour)	75.00
Depreciation	(₹ 8000 per quarter x 16 quarters) ÷ 5000 units	25.60
Packing	(0.4 cu.m. x ₹ 20)	8.00
Distribution	(3 kg x ₹ 5)	15.00
	Total Cost Per Unit	**144.60**

PROFITABILITY ANALYSIS

Q.4   RST Limited specialises in the distribution….

Solution

(i)   **RST Limited's**

Statement of operating income and gross margin percentage

for each of its three distribution channel

	General Super Market chains	Drugstore Chains	Chemist Shops	Total
Revenues: (₹)	2,80,41,750 (330 x ₹84,975)	2,38,21,875 (825 x ₹28,875)	1,49,73,750 (2,750x ₹5,445)	6,68,37,375
Less: Cost of goods sold: (₹)	2,72,25,000 (330 x ₹82,500)	2,26,87,500 (825 x ₹27,500)	1,36,12,500 (2,750 x ₹4,950)	6,35,25,000
Gross margin: (₹)	8,16,750	11,34,375	13,61,250	33,12,375
Less: Other operating costs: (₹)				8,27,970
Operating income: (₹)				24,84,405
Gross margin %	2.91%	4.76%	9.09%	4.96%
Operating income %				3.72%

(ii) Computation of rate per unit of the cost allocation base for each of the five activity areas for April 2004

		₹
Customer purchase order processing	(₹ 2,20,000÷ 5,500 orders)	40/ order
Line item ordering	(₹ 1,75,560 ÷ 58,520 line items)	3/line item order
Store delivery	(₹ 1,95,250 ÷ 3,905 store deliveries)	50/delivery
Cartons dispatched	(₹ 2,09,000 ÷ 2,09,000 dispatches)	1/ dispatch
Shelf-stocking at customer store (₹)	(₹ 28,160 ÷ 1,760 hours)	16/hour

(iii) Operating Income Statement of each distribution channel in April-2004 (Using the Activity based Costing information)

	General Supermarket Chains	Drugstore Chains	Chemist Shops
Gross margin (₹) : (A) (Refer to (i) part of the answer)	8,16,750	11,34,375	13,61,260
Operating cost (₹) : (B) (Refer to working note)	1,62,910	1,90,410	4,74,650
Operating income (₹) : (A –B)	6,53,840	9,43,965	8,86,600
Operating income (in %) (Operating income/Revenue) x 100	2.33%	3.96%	5.92%

Working note:

Computation of operating cost of each distribution channel:

	General Supermarket Chains	Drugstore Chains	Chemist Shops
	₹	₹	₹
Customer purchase order processing	15,400 (₹40 × 385 orders)	39,600 (₹40 × 990 orders)	1,65,000 (₹40 × 4125 orders)
Line item ordering	16,170 (₹ 3 × 14 × 385 orders)	35,640 (₹3 × 12× 990 orders)	1,23,750 (₹3 × 10 × 4125 orders)
Store delivery	16,500 (₹ 50 × 330 deliveries)	41,250 (₹ 50 × 825 deliveries)	1,37,500 (₹ 50 × 2750 deliveries)
Cartons dispatched	99,000 (₹ 1× 300 cartons × 330 deliveries)	66,000 (₹ 1 × 80 cartons × 825 deliveries)	44,000 (₹ 1 × 16 cartons × 2,750 deliveries)
Shelf stocking	15,840 (₹ 16 × 330 deliveries × 3 Av. hrs.)	7,920 (₹ 16 × 825 deliveries ×. 0.6 Av. hrs)	4,400 (₹ 16 × 2,750 deliveries × 0.1 Av. hrs)
Operating cost	1,62,910	1,90,410	4,74,650

Comments: The activity-based cost information highlights, how the 'Chemist Shops' uses a larger amount of RST Ltd's resources per revenue than do the other two distribution channels. 'Chemist Shops' ranking I under Traditional Method has actually moved to II place under ABC exchanging the ranks with 'Drugstore Chains'.

It may be further observed that 'General Supermarket chains' although has highest sales among three customer categories but has lowest share of operating income. Ratio of operating costs to revenues, across these markets is:

General supermarket chains (₹1,62,910 / ₹2,80,00,750) x 100	0.58%
Drug store chains (₹1,90,410 / ₹2,38,21,875) x 100	0.80%
Chemist shops (₹4,74,650 / ₹1,49,73,750) x 100	3.17%

New Insights available under ABC:

(i)   Classification of total overheads activity-wise
(ii)   Classification of activities under Value added & non value added is now possible and hence enables cost reduction drive.
(iii) Knowledge of Activity Cost drivers
(iv)   Operating Income margins are now available which will be helpful in decision-making.

(iv) Challenges faced in assigning total operating cost of ₹8,27,970 :

- Classification of total overhead costs into various activities requires identification of significant activities which in itself is a challenging task

- Choosing an appropriate cost driver for activity area – There may exist multiple cost drivers for a Single Activity e.g. Machine Setup activity may be traced on the basis of no. of set-ups or no. of machine hours.

- Developing a reliable data base for the chosen cost driver – Company may make the mistake of including abnormal costs or abnormal no. of units of cost driver

- Deciding, how to handle costs that may be common across several activities.

- Choice of the time period to compute cost rates per cost driver.

- Behavioural factors – Collection of operational data e.g. units of Cost Driver could be laborious and company may have to face employee resistance.

Q.8   A manufacturing organization….

Solution

Customer Profitability Statement

Particular	A	B	C	D
Selling prices net of discount	15,000 [60,000 x .25]	18,400 [80,000 x .23]	21,000 [1,00,000 x .21]	15,400 [70,000 x .22]
Less: Sales Visit	420 [2 x 210]	840 [4 x 210]	1260 [6 x 210]	630 [3 x 210]
Order placing	1800 [30 x 60]	1200 [20 x 60]	2400 [40 x 60]	1200 [20 x 60]
Product handling	6000 [60,000 x .10]	8000 [80,000 x .10]	10,000 [10,000 x .10]	7000 [70,000 x .10]
Normal delivery cost	400 [20 x 10 x 2]	900 [30 x 15 x 2]	500 [10 x 25 x 2]	1400 [50 x 14 x 2]
Rushed delivery cost	- [1 x 2]	-	200 [1 x 200]	400 [2 x 200]
Profit	6380	7460	6640	4770
Ranking	III	I	II	IV

BREAK-EVEN POINT

Q.3 A company makes 1,500 units……..

Solution

Data / Unit	1 – 500	501 – 1,500
	₹	₹
Sales (1,20,000 / 1,500)	80	80
Direct material (20,000 / 1,000)	20	20
Direct labour (WN#1)	20	26
Variable overheads 15,000 / 1,500	10	10
Contribution	30	24
No. of units	500	
Total contribution	15,000	
Fixed costs	16,800	
Shortfall	1,800	
No. of units required above 500 to recover shortfall	1,800 / 24 = 75	
Break even point	(500 + 75) = 575 units	

WN#1
Let X be the Direct Labour per unit upto 500 units
Total Direct Labour 500X + 1,000 (X + 6) = 36,000
$\qquad$ 1,500X + 6,000 = 36,000
$\qquad$ X = 20.
Therefore, up to 500 units the Direct Labour is Rs. 20. After 500 units it is Rs. 26.

Q.6　　The parts in an automobile company……

Solution

Particulars	Option – I [All units are tested]	Option – II [Units are Not tested]
For every batch of 1000 units, testing cost (fixed)	₹12,500 [12.50/units x 1000 units]	
Rectification cost	₹50/unit	₹100/unit

Indifference point $\quad = \quad \dfrac{\text{Change in fixed cost}}{\text{Change in variable cost}}$

$\qquad\qquad\qquad = \quad \dfrac{12,500}{100-50}$

$\qquad\qquad\qquad = \quad$ 250 units　　　　or

$\qquad\qquad\qquad = \quad$ 25%

Q.9   The budgeted results of A Ltd……

Solution

Statement of Profitability

Product	Profit / (Loss) (₹)	P / V Ratio (%)	Contribution (₹)
X	2,50,000	50	1,25,000
Y	4,00,000	40	1,60,000
Z	6,00,000	30	1,80,000
Total	12,50,000		4,65,000
Less: Fixed Overheads			5,02,200
Profit / (Loss)			(37,200)

Additional Total Sales Value maintaining the same Sale – Mix $= ₹37,200 ÷ 0.372^*$

$= ₹1,00,000$

* Combined P / V Ratio $= \dfrac{\text{Total Contribution}}{\text{Total Sales}} \times 100$

$= \dfrac{₹4,65,000}{₹12,50,000} \times 100$

$= 37.2\%$

Additional Sale Value of each Product to eliminate the loss

Product	Sales Value (₹)
X	₹20,000 (₹ 1,00,000 * 25/125)
Y	₹32,000 (₹ 1,00,000 * 40/125)
Z	₹48,000 (₹1,00,000 * 60/125)
Total Additional Sales	₹1,00,000

Q.12   Cable Vision Inc. is a leading

(a) Calculation of Contribution per subscriber

Particular	0-10000	10001-20000	20001-30000
Selling Price	20	20	20
Less: Variable cost			
- Variable revenue share to City of Mirada	2	1	1
- monthly change to Interlink cable	8	8	6
- Own VC	2	2	2
Contribution Per Unit	8	9	11

(b) Calculation of Fixed Cost

Particular	0-10000	10001-20000	20001-30000
- fixed commitment charges to City of Mirada	50000	75000	75000
- fixed fee to interlink cable	20000	20000	20000
- own FC	55000	55000	70000
Total FC	125000	150000	165000

Calculation of BEP

Particular	0-10000	10001-20000	20001-30000
FC to be recovered	125000	150000	165000
Less: Contribution earned upto previous range			
- 10000 subscribers @ 8	-	80000	80000
- Next 10000 subscribers	-	-	90000
			₹
Unrecovered FC	125000	70000	-5000
Contribution per unit of respective range	8	9	11
Additional no. of subscribers	15625	7777.78	-
Total BEP	15625	17777.78 ~ 17778	-*
Comment	Invalid BEP Falls outside range	Valid BEP Since falls within range	*No BEP exist since there is no unrecovered FC

Answer : BEP Subscriber = 17777.78 ~ 17778 subscribers

(c)   Calculation of Operating Income:

Particulars	10000	20000	30000
Contribution	80000	170000	280000
	[10000 x 8]	[(10000 x 8)+(10000 x 9)]	[(10000 x 8)+(10000x9)+(10000x11)]
(-) FC	125000	150000	165000
Profit/loss	**(45000)**	**20000**	**115000**

Comment: It may be observed that below 17778 subscribers we're in loss & above this no we're into profits

Conclusion: 0-1000   -   Loss
               10001 to 17777   -   Loss
               17778   -   BEP (No Profit No Loss)
               17779 to 20000   -   Profit
               20001 to 30000   -   Profit

Q.13 A Pharmaceutical company…….

Solution

Shelf life is one year hence opening stock of 15,000 boxes is to be sold first. Contribution on these boxes is 15,000(50 – 20) = ₹ 4,50,000.

In the question production of previous year is same as in the current year. Hence fixed cost for the year Previous Year is ₹ 20 per unit [₹ 14,30,000 / 1.10 = ₹ 13,00,000 for 65,000 units]. Therefore, Fixed cost for the current year is ₹ 22 per unit.

Variable Cost for the current year (₹ 20 + 25% of ₹ 20) = ₹ 25 per Unit

Hence Contribution per unit during current year is ₹ 25 (50 – 25)

Break even volume is the volume to meet the fixed cost i.e. fixed cost equals to contribution. Therefore, remaining fixed cost of ₹ 9,80,000 (14,30,000 – 4,50,000) to be recovered from production during current year.

Production in current year to reach BEP = 980000 / 25 = 39,200 units

Therefore, BEP for the current year is 54,200 boxes (15000 + 39200)

Calculation of Profit

Particulars	Amount	Particulars	Amount
To Opening Stock [15000 units * (20+20)	6,00,000	By Sales [75000 units x 50]	37,50,000
To Production Cost for the Current Year Production(65000 uinits)			
- VC @ 25	16,25,000	By Closing Stock [5000 units x (25 + 22)	2,35,000
- FC	14,30,000		
To Profit	3,30,000		

Q.15 The following are the cost data…..

Solution

1. The Cost Indifference Points computed are as under –

| Particulars	A	B	C
Nature	Manual	Semi-automatic	Fully-automatic
Fixed Costs	Rs.15,000	Rs.45.000	Rs.1,25,000
Variable Costs per report	Rs.240	Rs.140	Rs.40

Indifference Point = $\dfrac{\text{Difference in Fixed Costs}}{\text{Difference in Veriable Cost per Unit}}$ = computed for each set of option

Between A and B = $\dfrac{\text{Rs.45,000} - \text{Rs.15,000}}{\text{Rs.240} - \text{Rs.140}}$ = 300 reports.

Between B and C = $\dfrac{\text{Rs.1.25,000} - \text{Rs.45,000}}{\text{Rs.140} - \text{Rs.40}}$ = 800 reports.

Between C and A = $\dfrac{\text{Rs.1,25,000} - \text{Rs.15,000}}{\text{Rs.240} - \text{Rs.40}}$ = 550 reports.

Indifference point represents the situation when cost of two options are equal. Below this point, the option with the lower fixed cost is more economical and beyond this point, the option with the lower variable cost per unit (or higher PV ratio) will be cheaper. In the above case, the interpretation of the indifference point and the decisions are as under: (the numbers indicate the number of reports / cases handled)

Nil	300	550	800

Choice   A   A or B   B   A or C   B   B or C   C
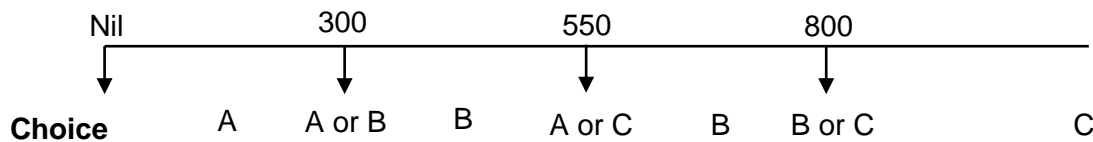
2. Decision / Interpretation:

Number of Cases / repots	Choice of method	Reason
Less than 300 cases	A (Manual)	Due to Lower Fixed Cost'
Exactly 300 cases	Either A or B	Indifference Point (between A and B).
Above 300 but less than 800 cases	B (Semi-automatic)	Next Range of Lower Fixed Costs.
Exactly 800 cases	Either B or C	Indifference Point (between B and C).
Above 800 cases	C (Fully automatic)	Lower Variable Costs per report / case.

- Present Case Load = 600 cases. The is in the range 300 to 800. Hence Method B (semi-automatic) can be used.
- When the Case Load is expected to go up to 850 cases in the near future, the Court should opt for Method C (fully automatic)

Note: Indifference point between A and c (550 cases) is not relevant-for decision. Making since B is profitable in the range 300 to 800 cases. This indifference point will be relevant only if the choice lies between A and C'

3. Cost of various options at 550 cases

Particulars	A	B	C
Fixed Costs	Rs.15,000	Rs.45,000	Rs.1,25,000
Variable Costs	Rs.240x550 = Rs.1,32,000	Rs.140x550=Rs.77,000	Rs.40x550=Rs.22,000
Total Costs	**Rs.1,47,000**	**Rs.1,12,000**	**Rs.1,47,000**

At this level, B is more profitable than A and C. Hence this indifference point becomes irrelevant in the overall analysis among A, B and C.

Q.16   Mayura Co. operates its plant…..

Solution   **(i) Comparative Statement of Cost**

(when demand for the product is 10,000 units)

Particulars	Working overtime for producing 2,000 units	Working second shift for producing 2,000 units
Variable Cost	24,000	21,000
Fixed Cost	NIL	6,000
Total Cost	24,000	27,000

* 8000 units in fact are produced in the single shift hence irrelevant. Alternatively, we may also add Cost of 8000 units under both the options. In any cost, differential cost will be the same resulting in same decision.

Decision: Resorting to overtime for producing additional 2,000 units and 8,000 units in the single shift will be beneficial to the extent of Rs.3,000 (i.e.. Rs. 27,000 — Rs. 24.000)

(ii) Range of output for overtime working and second shift operation:

Let X be the number of units at which their total cost under overtime working and second shift operation equalises. i.e. X units x Rs. 12 + Rs. 30,000 = X units x Rs. 10.50 + Rs. 36,000

On solving the above relation we get X = 4,000 units.

Range	Method to be adopted
Above 8,000 units but less than 12,000 units	Overtime working
At 12,000 units	Any one method may be adopted
12,001 to 16,000 units	Second shift working

(iii) Computation of Prediction Error:

Cost Statement of producing 11,000 units

Particular	Options	
	Working overtime for producing 3000 additional units Rs.	Working second shift for producing 3,000 additional units Rs.
Cost of Producing 8,000 units in first shift (8,000 units x Rs. 10 + Rs. 30,000)	1,10,000	1,10,000
Additional cost of producing 3,000 units	36,000 (3,000 units x Rs. 12)	37,500 (3,000 units x Rs. 10.50 + Rs. 6,000)
Total Cost	1,46,000	1,47,500

Prediction error: A comparison of total cost of producing 11,000 units under overtime working and second shift working clearly shows a difference of Rs. 1,500 (Rs 1,47,500 — Rs. 1,46,000). The difference of Rs. 1,500 is due to prediction error.

DECISION MAKING
UNIT I: RELEVANT COSTING

Q.14   S Ltd. Engaged in manufacturing activities…..

Solution

Statement Showing Minimum price to be charged based on Relevant Cost

Particulars	Relevancy & Reason	₹
Material M	Slow moving material. Realizable value is relevant as opportunity cost	80.00
Labour Cost	The workers are permanent employees. Assume no retrenchment policies exist. Committed Cost are not relevant	Nil
Out of Pocket Expenses	Specially Incurred. Hence relevant.	30.00
Allocated Overhead	Allocation is not specifically incurred. Hence irrelevant	Nil
	Minimum Price to be charged	110.00

Q.19   Precision Toolings Ltd (PTL) entered …..

Solution

Statement of Relevant Costs for HML Contract

Particulars	Relevancy & Reason	Rs.
Original Selling Price	Rs.27,000 – relates to original conditions – Irrelevant begin historical in nature	Nil
Non-refundable Deposit	Rs.2,500 – relates to original conditions – Irrelevant being historical in nature	Nil
Estimated Costs of the Machine Tool	Relates to original conditions – Irrelevant being historical in nature	Nil
Costs incurred upto date of insolvency	Historical and Irrelevant	Nil
Realisation from Scrap	Foregone if HML contract is obtained – hence opportunity Cost is relevant = 1,900 + 1,600 – 200 + 2,250	5,550
Additional Material Costs	Already in Stock – Regularly used – Hence, Replacement Cost of materials is relevant	3,900
Labour Costs	Variable and Relevant	1,300
Variable Overheads	To be incurred – Out – of – pocket costs – relevant	900
Fixed Overheads	Presumed as additional and hence relevant	1,100
	Min. Price = Total Relevant Costs for the Contract	**12,750**

Q.21   ABC Ltd. has just completed production….

Solution

Calculation of Minimum Selling Price

	Particular	Relevancy & Reason	Computation	Amount
1.	Material	Relevant cost is benefit in value from another product	--	₹1900
2.	Direct wages - Department L	Relevant cost is labour cost + opportunity loss of contribution being labour is key factor	[3men x 4weeks x ₹75] + [900 x 2.5/₹10 labour]	3150
	- Department M	Relevant cost is nil since labour are idle	--	--
3.	Variable OH	Relevant cost since additional in nature	900 x 20%	₹180
4.	Fixed OH	Mere absorption is irrelevant cost	--	--
5.	Opportunity loss			
(i)	Opportunity from sale of basic material	Relevant cost being inflow avoided	[1500+(1000-90)-300]	2110
(ii)	Design & specification	Relevant cost being inflow avoided	--	2750
6.	Supervisor	Relevant cost being additional in nature	--	450
7.	Non-refundable deposit	Irrelevant being his historical cost	--	--
		Total relevant cost		₹8540

Minimum price is relevant cost i.e. ₹8540

Q.23 Assembly Elections are round …….

Solution

Calculation of Minimum selling price

	Particular	Reason & Relevance	Amount
1.	Material		
	- Paper	Relevant cost is current resale price being material not in regular use	₹25,000
	- Inks	Relevant cost is purchase cost being amount to be agent whole of the cost is incurring for special order those by also charging the same	30,000
2.	Labour		
	- Skilled	Relevant cost being incremental in nature	6250 + 5000 [(250 hrs x 50%) x(₹40 per hour + 25%)] + [125 hrs x ₹40]
	- Unskilled	Irrelevant cost since additional amount is not incoming due to this order benefit to employees are given in non-monetary from i.e. time off for time off they are paid which would also be paid (in also once of order) as idle hrs.	Nil
3.	Variable overheads	Relevant cost being additional in nature	14,000
4.	Depreciation	Irrelevant being mere apportionment of historical cost	-
5.	Opportunity loss (rent)	Relevant cost being opportunity loss of contribution	6000 [200 hrs x ₹30/hrs]
6.	Fixed Production Cost	Irrelevant being mere apportionment of overheads	-
7.	Estimating department cost	Irrelevant being past cost	-
		Total relevant cost	86,250

Minimum price that company would accept for the order is ₹86,250

Q.26   Johnson trades as a chandler......

Solution:

1. Computation of Relevant Cost

	Particulars	Relevancy & Reason	Computation	Amount
1.	Cost of employee	Relevant cost being additional in nature	-	2000
2.	Salary	Relevant cost being invariantly in nature	$\left(\frac{11000}{110} \times 100\right) +$ $\left(\frac{8800 \times 2 \times 100}{110}\right)$	26000
3.	Maintenance & painting work	Relevant revenue being outflow avoided. Among 2 quotations, in no order case, rationally one will choose for lowest one.	[2500-1000]	(1500)
4.	Machine cost	Relevant cost is fall current resale price since Machine is not in regular use	6000-3000	3000
5.	Material			
	- A	Relevant cost is current purchase price being material is in regular use.	1000x3	3000
	- B	Relevant cost is current purchase price being material is in regular use.	1000x0.90	900
	- C	Relevant cost is current purchase price being amount to be spent.	100x6	600
	- D	Relevant cost for units in stock in current resale price for unit to be purchased is current purchase price	(100x3) + (100x2)	500
	- E	Relevant cost is current purchase price being material in regular use	5000x0.20	1000
	- F	Relevant cost is current resale price being material is not in regular use for units in stock & current purchase price for units to be purchased	(1000x1)+(2000x2)	5000
6.	Direct expense	Relevant cost being additional in nature	-	6500
7.	Opportunity loss	Relevant cost being inflow avoided from another opportunity	15,000-(10,000+2000)	3000
			Total relevant cost	50,000

The price at which Johnson should be willing to take on the contract in order to break even is 50,000.

2. Other factors have already discussed in the class

UNIT II: KEY FACTOR

Q3.   An Engineering company is engaged….

Solution: Statement showing optimal product mix & maximum contribution W/o training:

Particulars	Welding department		Pressing department	
	W1	W2	P1	P2
Selling price unit	48	50	77	69
Less: VC pu				
- Material	(18)	(22)	(32)	(44)
- labour	(16)	(16)	(20)	(8)
- VOH	(2)	(2)	(3)	(3)
CPU	12	10	22	14
No. of labour hrs.	4	4	5	2
Contribution per hrs	3	2.5	4.4	7
Ranking	I	II	II	I
Allocation of hrs				
Minimum demand	8000	10,000	9000	4400
Freely allocation hrs	2000 [20000-8000-10000]	--	--	2600 [16000-9000-4400]
No. of units	2500 [10000/4]	2500 [10000/4]	1800 [9000/5]	3500 [7000/2]
CPU	12	10	22	14
Contribution	30000	25000	39600	44000
Total Contribution	143600			
(-) Fixed cost	(50000)			
Total Profit	93600			

After training combined hrs availability = 36000 hrs.

Freely allocable hrs. would be 4600 hrs. which will be allocated to product P2, since it ranks I among all 4 products. Even without training 2600 hrs. were still allocated to product P2 the difference would be only be to the extent of incremental 2000 hrs.

Evelution of decision to train

Incremental contribution [(₹7/hr - ₹3/hr) x 2000 hr]	8000
(-) Additional FC	(5000)
Incremental Benefit	**3000**

Company should train the workers since it results in net benefit of ₹3000 in addition to financial considerations Company should also take into account following factors:

(i)   Impact on efficiency of worker as the new workers may not be equally efficient immediately after training.
(ii)   Impact on product quality as the newly trained workers will still be inexperienced.

Q.7　　ZED Ltd. manufactures two products P and Q

Solution

Working Notes :

1.　　　　　　　　Computation of total labour hours available

Departments (a)	No. of workmen (b)	Days (c)	Hrs./day (d)	Total hours (e) = (b) × (c) × (d)
A	30	300	8	72,000
B	16	300	8	38,400
C	18	300	8	43,200
D	24	300	8	57,600

2.　　　　　　　　Computation of hours required per unit of each product

Departments	Product P			Product Q		
	Wages (₹)	Wages/hr. (₹)	Hrs.	Wages (₹)	Wage/hr. (₹)	Hrs
	(a)	(b)	(c) = (a)/(b)	(d)	(e)	(f) = (d)/(e)
A	36	6	6	54	6	9
B	18	6	3	36	6	6
C	54	6	9	--	--	--
D	--	--	--	72	6	12

3.　　　　　　　　Statement showing maximum output permissible

Departments	Hours available	Product P		Product Q	
		Hrs. required/ Unit	Maximum output in Units	Hrs. required/ Unit	Maximum output in Units
	(a)	(b)	(c) = (a)/(b)	(d)	(e) = (a)/(d)
A	72,000	6	12,000	9	8,000
B	38,400	3	12,800	6	6,400
C	43,200	9	4,800*	--	--
D	57,600	--		12	4,800*

* This shows that either 4,800 units of product P or Q can be obtained by utilising the available hours in the four departments.

Checking for the existence of Key Factor based on the Maximum possible production of 4800 units of Prod P and Prod Q as calculated above

Department	Availability	Hours Required to produce		Total Hours Requirement	Whether Key Factor?
		Product P	Product Q		
Deptt A	72,000	28,800 [4800 Units * 6 hrs per unit]	43,200 [4800 * 9]	72,000	No
Deptt B	38,400	14,400 [4800 * 3]	28,800 [4800 * 6]	43,200	Yes

4.   **Statement showing Optimal Product Mix**

	Product P (₹)	Product Q (₹)
Selling price p.u. (A) Total raw material cost p.u.	215	320
(₹ 22 + ₹ 8)	30	
(₹ 28 + ₹ 32)		60
Total wages per unit (₹ 36 + ₹ 18 + ₹ 54)	108	
(₹ 54 + ₹ 36 + ₹ 72)		162
Variable overheads p.u.	23	17
Total variable cost p.u. (B)	161	239
Contribution p.u. [(A) – (B)]	54	81
Labour hours p.u. in Deptt B (being Key Factor)	3	6
Contribution per labour hour	18	13.5
Rankings	I	II
Allocation of Hrs in Deptt B	14,400 [4800 * 3]	24,000 [B/f]
No. of Units i.e. Optimal Product Mix	4800 Units	4000 Units
Total Contribution	2,59,200	3,24,000
	583200	
Less: Fixed Costs	144000	
	439200	

(b) **Statement of most profitable product if only one product is to be manufactured**

Products	P	Q
Contribution per unit (₹) : A	54.00	81
Maximum possible output (in units) : (B)	4,800	4,800
Total Contribution : (A) × (B)	2,59,200	3,88,800

Product Q is to be preferred. Max Profit in that case = ₹ 3,88,800 - ₹ 1,44,000 = ₹ 2,44,800

Statement of most profitable product if only one product is to be manufactured and licence to import the raw material is only for materials worth ₹ 1,80,000

Products	P	Q
Raw material required p.u. (₹)	30	60
Permissible output in units out of imported material of ₹ 1,80,000	6,000	3,000
Maximum output possible in the available hours	4,800	4,800
Output possible keeping in view the availability of imported material and labour hours (Units)	4,800	3,000
Contribution per unit (₹)	54	81
Total Contribution (₹)	2,59,200	2,43,000
	(4,800 units × ₹ 54)	(3,000 units × ₹ 81)

Product P is to be preferred (i.e. answer differs) because of import licence restriction, which is only available for purchasing material worth only ₹ 1,80,000. Max. Profit if Product P is produced = ₹ 259200 - ₹ 144000 = ₹ 115200

Q.11   The budgeted data relating to two products…..

Solution

Let x and y be the number of units of product A & B respectively. the objective function is to maximize profit, where profit = total contribution – fixed costs.

Contribution per unit of the products = selling price – variable Mfg costs – variable selling commission

- For product A: Rs.300 - Rs.160 – Rs.60 = Rs.80
- For product B: Rs.200 - Rs.60- Rs.40 = Rs.100

Hence total contribution = 80x + 100y. also, total fixed costs = 14000+20000= Rs.34000

Hence, Objective function is:-

Maximise $Z = 80x + 100y - 34{,}000$

Subject to:

$2x + 4y \leq 1{,}400$	(department p time availability)	………equation 1
$5x + 4y \leq 2000$	(department Q time availability)	……..equation 2
$X, y \leq 400$	(maximum sale quantity)	…………….equation 3
$X, y \geq 0$	(non –negativity assumption)	
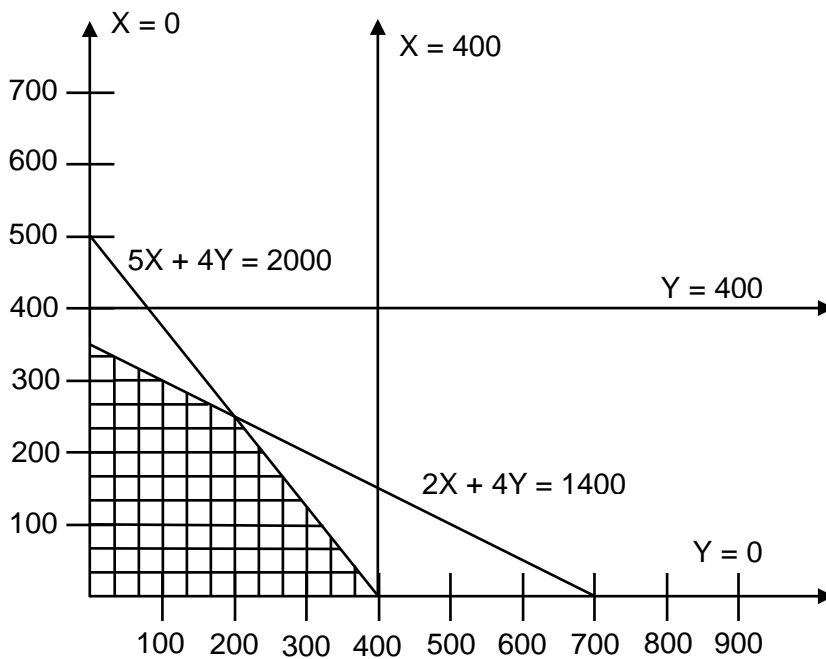
From equation 1, we have 2x +4y=1400.

When x = 0,y = 300,

Also, x =700 when y = 0

From equation 2, We have 5x + 4y =2000.

When x = 0,y = 500,

Also, x = 400 when y=0

Eqn.3 represents two straight lines x = 400 & y = 400

After drawing the graph given, the co-ordinates of

Feasible region are identified for computation of z.

Co-ordinate	value of z = = 80x +100y – 34,000
(0, 0)	-34,000
(0, 350)	1000
(200, 250)	**7,000 (maximum)**
(400, 0)	-2,000

Decision: The company should produce 200 and 250 units of A and B respectively to maximize its profit at Rs.7000 per month.

Q.18   The Management accountant of Atul Enterprises....

Solution

Let the no. of units of Product A,B,C,D & E to be produced be denoted by Variables X_1, X_2, X_3, X_4 & X_5 respectively

Maximise Contribution $Z = 15 X_1 + 12 X_2 + 16 X_3 + 12 X_4 + 7 X_5$

Subject to,

$X_1 \leq 1,500$

$X_2 \leq 1,200$

$X_3 \leq 900$

$X_4 \leq 600$

$X_5 \leq 600$ (Maximum Demand Constraint)

$X_1 + X_2 + 3 X_3 + 4 X_4 + 5 X_5 \leq 5,800$ (Max Special Component Availability Constraint)

$12 X_1 + 10.67 X_2 + 4 X_3 + 2.67 X_4 + 2.67 X_5 \leq 20,000$ (Max Labour Hours Constraint)

$15 X_1 + 14 X_2 + 16 X_3 + 15 X_4 + 16 X_5 \leq 30,000$ (Max Material Cost Constraint)

$X_1, X_2, X_3, X_4, X_5 \geq 0$ (Non-Negativity Assumption)

Q.36   A company manufactures two products. Each product passes...

Solution:

(a)   Since it is a case of 2 products *plus* multiple key factor situation we'll solve it using graphical method

Calculation of Contribution pu

	X	Y
SP Less: VC	90	80
- Material	10 [2kg x ₹5]	10 [2kg x ₹5]
- Machine cost		
Deptt A	20 [0.5 hrs x ₹40ph]	12 [0.3 hrs x ₹40 ph]
Deptt B	24 [0.4 hrs x ₹60 ph]	27 [0.45 hrs x ₹60 ph]
	36	31

Objective function: -
Maximize $Z = 36X + 31Y$

Constraints: -
X $\leq$ 7400
Y $\leq$ 10000 (Max. demand constraint)
0.5X + 0.3Y $\leq$ 3400 (Depth A hrs Constraint)
0.4X + 0.45Y $\leq$ 3640 (Depth B hrs Constraint)
2X + 2Y $\leq$ 17000 (Direct material availability constraint)
X, Y $\geq$ 0 (NNA)

Find coordinates

Constraints	When X = 0	When Y = 0	Coordinates
X = 7400			Straight line at X = 7400
Y = 10000			Straight line at Y = 10000
0.5X+0.3Y=3400	11333.33	6800	(0, 11333.33) (6800, 0)
0.4X+0.45Y=3640	8088.89	9100	(0, 8088.89) (9100, 0)
2X + 2Y = 17000	8500	8500	(0, 8500) (8500, 0)

Plot on graph
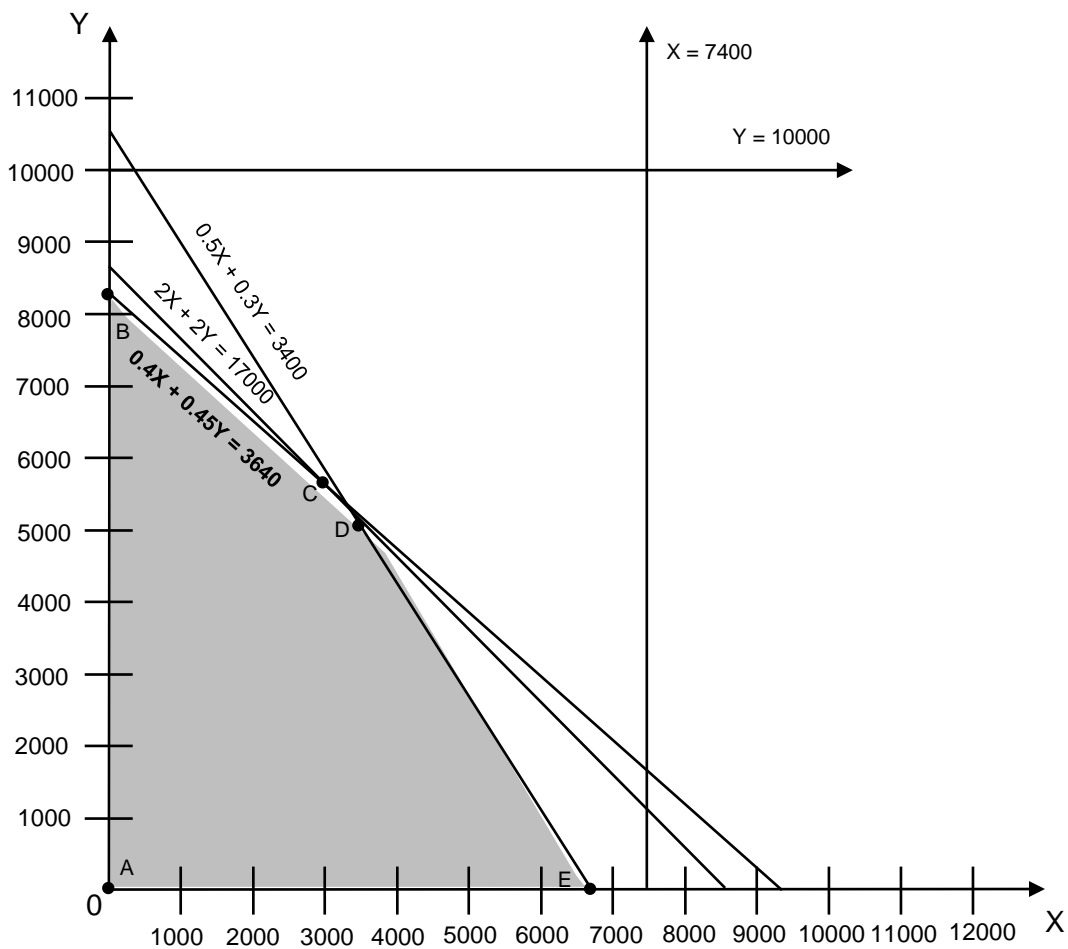
Finding values of x, y at corner points

At A   = 0,0

At B   = 0,8088.89

<u>At C</u>

$$2x + 2y = 17000 \quad \text{....... equation no .1}$$
$$0.4x + 0.45y = 3640 \quad \text{...…. equation no.2}$$

Multiplying Equation No .2 by 5 & subtracting equations from each other, we get

$$2x + 2y = 17000$$
$$2x + 2.25y = 18200$$
$$\text{-} \quad\quad \text{-} \quad\quad\quad \text{-}$$
$$- 0.25y = - 1200$$
$$Y = 4800$$

Also,

$$2x + 2 \times 4800 = 17000$$
$$X = 3700$$

At C = 3700, 4800

<u>At D</u>

$$2x + 2y = 17000 \quad \text{...… equation no.1}$$
$$0.5x + 0.3y = 3400 \quad \text{...… equation no.2}$$

Multiplying equation no.2 by 4 & subtracting equation from each other we get

$$2x + 2y = 17000$$
$$2x + 1.2y = 13600$$
$$\text{-} \quad\quad \text{-} \quad\quad\quad \text{-}$$
$$- 0.8y = 3400$$
$$Y = 4250$$

Also,

$$2x + 2y = 17000$$
$$2x + 2 \times 4250 = 17000$$
$$X = 4250$$

At D = 4250, 4250

At E = 6800, 0

Evaluation in the Objective Function

Corner Points (x, y)		Objective function Max Z = 36x + 31y
A	(0, 0)	0
B	(0, 8088.89)	250750
C	(3700, 4800)	282000
D	**(4250, 4250)**	**284750**
F	(6800, 0)	244800

Decision: Company should produce Prod X = 4250 units, Prod Y = 4250 units to earn Max Contribution of Rs. 284750.

(b) Evaluation of both the alternatives

Particulars	If only product X is produced	If only product Y is produced
Possible production based on Availability of:-		
Raw material	8500 [1700kg / 2kg]	8500 [1700/2]
Machine - Deptt A	6800 [3400/0.5]	11333.33 [3400/0.3]
Machine - Deptt B	9100 [3640/0.4]	8088.89 [3640/0.45]
Max. demand	7400	10000
Max. possible production (least of above calculation)	6800 [see note below]	8088.89 [see note below]
Contribution per unit	36	31
Total contribution	244800	250750

Note: 6800 units & 8088.89 units could also be found from graph be being coordinates at the most binding constraint on X axis & Y axis of the graph respectively.

Decision: If only one of the product could be produced then Company should produce Product Y since it results in Max Total Contribution of ₹250750.

UNIT III: MAKE OR BUY

Q.14   GG Ltd. manufactures and sells…..

Solution

1. **Present demand of components (in batches) from 10,800 (maximum) available machine hours and projected estimates of components demand (in batches) in the next year.**

   Maximum available machine hours   10,800

   Machine hours needed to manufacture components. A, B and C (Per batch of ten numbers) of water purifier

Components			Total
A	20	Machine hours	
B	28	Machine hours	
C	24	Machine	**72 hours**

   Present demand (in batches) of components A, B and C (10,800 hours/ 72 hours)   150

   Projected estimate of demand of components A, B and C (add 50% increase)   225
   in the next year

2. **Present and future fixed costs:**

Present fixed cost of 150 batches @ Rs.200/- per batch	30,000
Add: Increase in fixed cost to meet 50% increase in demand	10,000
Total future fixed cost for 225 batches	40,000

3. **Expected purchase cost of components**

View point	Probability	Component		
		A	B	C
		Expected price	Expected Price	Expected Price
		Rs.	Rs.	Rs.
Pessimistic	0.25	30 (Rs.120×0.25)	50 (Rs.200×0.25)	40 (Rs.160×0.25)
Most likely	0.50	55 (Rs.110×0.50)	65 (Rs.130×0.50)	70 (Rs.140×0.50)
Optimistic	0.25	20 (Rs.80×0.25)	35 (Rs.140×0.25)	30 (Rs.120×0.25)
Total		105	150	140

4. **Present contribution (per batch)**

	Rs.	Rs.
Selling price (per batch)		800
Less: Variable production cost	320	
Less: Variable assembly cost	50	370
Contribution (per batch)		430
Total Present contribution on 150 batches		64,500

(i) **Maximum number of batches that could be produced in 10,800 machine hours each of the three alternatives namely buying A or B or C is considered respectively.**

(a)   Buy component   A (from outside)   No machine hour required
       Make component   B   28   Machine hours required
       Make component   C   <u>24</u>   Machine hours required
                             Total   <u>52</u>

Number of batches that could be produced internally 207.69 batches (10,800 hours/52 hours)

(b)   Buy component   B (from outside)   No machine hour required
       Make component   A   20   Machine hours required
       Make component   C   <u>24</u>   Machine hours required
                             Total   <u>44</u>

Number of batches that could be produced internally 245.45 batches (10,800 hours/744 hours)

But in view of projected (expected) market demand of 225 batches, production would be restricted to 225 batches only.

(c)   Buy component   C (from outside)   No machine hours required
       Make component   A   20   Machine hours required
       Make component   B   28   Machine hours required
                             Total   48

Number of batches that could be produced internally 225 batches (10,800 machine hours 748 hours)

(ii) **Statement of financial implication when purchases of component A, B and C are made from outside**

   (in view of the fact that production capacity will be limited to 50% increase)

Component bought	A	B	C
	Rs.	Rs.	Rs.
Total variable cost per batch (I)	64	108	116
Expected purchase cost (II)	105	150	140
Increase in variable cost per batch (III) = (II – I)	41	42	24
Present contribution per batch (IV)	430	430	430
Revised contribution per batch (V) = (IV – III)	389	388	406
Total revised contribution	80,791 (207.69 batches × Rs.389)	87,300 (225 batches × Rs.388)	91,330 (225 batches × Rs.406)

Advise: Purchase component C from outside as it gives maximum contribution on manufacturing A and B internally.

(iii) Profit Statement
(When C is bought from outside and A, B were manufactured internally and extra production is made and sold)

	Per Batch Rs.	Total (for 225 batches)
		Rs.
Sales revenue: (I)	800.00	1,80,000 (225 batches × Rs.800)
Less: Variable costs (Rs. (Per batch) : (II) Production cost of A Rs.64 Production cost of B Rs.108 Production cost of D Rs.24 Production cost of E Rs.8 Production cost of C Rs.140 Rs.344		
Assembly cost Rs.50	394.00	88.650 (225 batches × Rs.394)
Contribution: (III) – (II)	406.00	91,350
Less: Fixed costs (Rs.40,000 / 225 batches)	177.78	40,000
Profit	228.22	51.350

Q.23   A company manufacturing a highly successful….
Solution
Total Cost per tube including EMO:

Direct Material	(108/24)	= ₹ 4.50
Direct Wages	(72/24)	= ₹ 3.00
Variable Overheads	[54/24 – 450000/300000]	= ₹ 0.75

Particulars	Total Cost (₹)	Tube Cost (₹)	Product Cost (₹)
Material	4.5	0.9	3.60
Wages	3.0	0.3	2.70
Variable Overhead	0.75	0.075	0.675
	8.25	1.275	6.975

Statement showing computation of manufacturing cost of 300000 tubes

Cost of making (300000 x 1.275)   = ₹ 3,82,500
Cost of buying (300000 x 1.35)   = ₹ 4,05,000

It is better to make the tubes at 300000 level of output.

Computation of Cost for additional tubes:

Particulars	50000	150000
Cost of Making (₹)	93750 [(50000 x 1.275) + 30000]	221750 [(150000 x 1.275) + 30000]
Cost of Buying (₹)	67500 (50000 x 1.35)	202500 (150000 x 1.35)

From the above, it is better to buy at these levels.

(ii) The level at which it is beneficial to make the tubes over and above 300000 units.
[Indifference Point] x (Fixed Cost/Diff. in Variable Cost per unit)   = 30,000 x (1.35-1.275)
= 4,00,000 units.

The Company will be justified to install the additional Equipment for the manufacture of Empty tubes at a sales volume of 700000 units.

Statement showing computation of Profit at three levels of output:

	Particulars	**300000**	**350000**	**450000**
I.	Sales [240/24] (₹)	3000000	3500000	4500000
II.	Cost (₹)	2092500 (300000x6.975)	2441250 (350000x6.975)	3138750 (450000x6.975)
III.	Tube Cost (₹)	382500 (300000x1.275)	472500 (350000x1.35)	607500 (450000x1.35)
IV.	Fixed cost (₹)	450000	450000	450000
V.	Total Cost (₹)	2925000	3363750	4196250
VI.	Profit (I – V) (₹)	75000	136250	303750

UNIT IV: KEEP OR DROP

Q.3   A Ltd. produces and markets a range of consumer.....

Solution

Statement showing value of total work undertaken by X Ltd. at customer's price

(Rs. '000)

Material cost (for appliances covered under agreement)	825
Material cost (for appliances not covered under agreement)	275
Labour cost (for appliances covered under agreement)	1,000
Labour cost (for appliances not covered under agreement)	240
Total receipts	2,340

Break up of receipts:

Big appliances	60%	1,404
Small appliances	40%	936

Profitability Statement

(Rs. '000)

	Option 1	Option 2	Option 3
Income:			
Big appliances	129.6 (60% x Rs,216)	1,404	1,404
Small appliances	936	86.4 (40% × Rs.216)	936
Total receipts: (A)	1,065.6	1,490.4	2,340
Costs:			
Material	320 40% × (825 + 275)	480 60% × (825 + 275)	800 (825 + 275)
	137.5%	137.5%	137.5%
Heat, rent, light etc.,	125	50	150
Management costs	108	83	150
Service staff costs	230	440	750
Transport costs	25	220	230
Total costs : (B)	808	1,273	2,080
Profit : [(A) – ((B)]	257.6	217.4	260

Recommendation:

Option 3 is most profitable one.

Working Notes:

1. Material and labour cost (for appliances under after sales agreement) :

		Rs.
(i)	Cost of material per unit charged to customer's by X Ltd. (Rs.100 + 10% (Rs.100+ 25% x Rs.110)	137.50
	Cost of material charged to customer's by X Ltd. $\left(\frac{Rs.60,000}{Rs.10} \text{ x Rs. } 137.50\right)$	8,25,000
(ii)	Cost of labour charged to customers by X Ltd. $\left(\frac{Rs.1,00,000}{Rs.10}\right)$ x 100	10,00,000

2. Material and Labour cost (for appliances not covered under sales agreement) :

		Rs.
(i)	Cost of material charged to customers by X Ltd. $\left(\frac{Rs.20,000}{Rs.10} \times \text{ Rs. } 137.50\right)$	2,75,000
(ii)	Cost of labourer charged to customers by X Ltd. $\left(\frac{Rs.36,000}{Rs.15}\right)$ x 100	2,40,000

UNIT V: BUSINESS DECISIONS

Q.3   Times of India is considering launching…..
Solution

1. Analysis of Semi-Variable Costs

Method	A	B
Semi – Variable Costs for 3,50,000 Copies	5,50,000	4,75,000
Semi – Variable Costs for 4,50,000 Copies	6,50,000	5,25,000
Semi – Variable Costs for 6,50,000 Copies	8,50,000	6,25,000
Variable Cost per Copy	Re. 1	Re. 0.50
Therefore, Variable Costs for 350000 Copies	3,50,000	1,75,000
Therefore, Fixed Costs	2,00,000	3,00,000
Specific Fixed Costs (as given)	8,00,000	12,00,000
Therefore, Total Fixed Costs	10,00,000	15,00,000
Total Variable Costs	5.50 + 1.00 = 6.50	5.00 + 0.50 = 5.50

Present Profit: 2,20,000 x (Rs.8.50 – Rs.3.50) – Rs. 8,00,000 = Rs.3,00,000

2. Statement of Profitability at differing sales volumes
If Method A were considered

Situation	(b)		(a)		(c)	
Magazine	**New**	**Existing**	**New**	**Existing**	**New**	**Existing**
Quantity	4,00,000	1,80,000	5,00,000	1,70,000	6,00,000	1,60,000
Selling Price per Copy	10.00	8.50	10.00	8.50	10.00	8.50
Variable Cost per Copy	6.50	3.50	6.50	3.50	6.50	3.50
Contribution par Copy	**3.50**	**5.00**	**3.50**	**5.00**	**3.50**	**5.00**
Total Contribution (Rs.)	14,00,000	9,00,000	17,50,000	8,50,000	21,00,000	8,00,000
Less: Fixed Cost	10,00,000	8,00,000	10,00,000	8,00,000	10,00,000	8,00,000
Profit	**4,00,000**	**1,00,000**	**7,50,000**	**50,000**	**11,00,000**	**NIL**
Total Profit	Rs.5,00,000		Rs.8,00,000		Rs.11,00,000	
Additional Profit	Rs.2,00,000		Rs.5,00,000		Rs.8,00,000	

If Method B were considered

Situation	(b)		(a)		(c)	
Magazine	**New**	**Existing**	**New**	**Existing**	**New**	**Existing**
Quantity	4,00,000	1,80,000	5,00,000	1,70,000	6,00,000	1,60,000
Selling Price per Copy	10.00	8.50	10.00	8.50	10.00	8.50
Variable Cost per Copy	5.50	3.50	5.50	3.50	5.50	3.50
Contribution per Copy	**4.50**	**5.00**	**4.50**	**5.00**	**4.50**	**5.00**
Total Contribution (Rs.)	18,00,000	9,00,000	22,50,000	8,50,000	27,00,000	8,00,000
Less: Fixed Cost	15,00,000	8,00,000	15,00,000	8,00,000	15,00,000	8,00,000
Profit	**3,00,000**	**1,00,000**	**7,50,000**	**50,000**	**12,00,000**	**NIL**
Total Profit	Rs.4,00,000		Rs.8,00,000		Rs.12,00,000	
Additional Profit	Rs.1,00,000		Rs.5,00,000		Rs.9,00,000	

3. Copies to be sold too recover fixed cost and make no additional profit

Method	A	B
Fixed Costs to be Recovered	10,00,000	15,00,000
Contribution per Copy of new publication	3.50	4.50
Less: Reduction in Contribution of Existing Publication (5.00 ÷ 10)	0.50	0.50
Net Contribution per Copy	3.00	4.00
Hence, no. of copies to be sold to recover Fixed Cost	3,33,333	3,75,000

Alternatively:

Let the no. of new magazines be "X" copies under Method A and "Y" copies under Method B:

Particular	Method A		Method B	
	New	**Existing**	**New**	**Existing**
Copies	X	220000 – X/10	Y	220000 – Y/10
Contribution per copy	3.50	5.00	4.50	5.00
Total Contribution	3.50X	1100000 – X/2	4.50Y	1100000 – Y/12
Less: Fixed Cost	18,00,000		23,00,000	
Profit	3X – 7,00,000		4Y – 12,00,000	
Present Profit	3,00,000		3,00,000	
Equation:	3X – 700000 = 3,00,000		4Y - 12,00,000 = 3,00,000	
On Solving, we have,	X = 3,33,333 Copies		Y = 3,75,000 Copies	

Conclusion:

(2) Sales Volume   Option   Reason
      < 5,00,000 Copies p.m.   A   Lower Fixed cost
      = 5,00,000 Copies p.m.   A or B   Same Profit i.e. Indifferent Point
      > 5,00,000 Copies p.m.   B   Lower Variable Cost or Higher PV Ratio.

(3) Minimum Copies too be sold to maintain the same profit are:
      Method A = 3,33,333 Copies, and Method B = 3,75,000 Copies. If the Company forecasts low demand situation, it should choose Method A

(4) BEP/Shutdown Point of existing Magazine   = 8,00,000 ÷ 5 = 1,60,000 Copies
      Present Margin of Safety   = 60,000 Copies
      If new magazine i.e. Method A or Method B sells more than 6,00,000 Copies (60000 x 10). It is preferable to close the existing magazine since it will operate below shut down point.

Q.5   The Sales Manager of Sunflag iron & steel…..

Solution

(i)   Statement of sales, costs and profit expected from alternative ways of increasing production

	Subcontract	Additional shift	Additional plant
	Rs	Rs	Rs
Additional sales (2,000 tons)	50,00,000	50,00,000	50,00,000
Cost increases:			
Materials (Rs 30,00,000/8000=Rs 375 per ton)		7,50,000	7,50,000
Direct wages	41,00,000		
Production variable overhead (Rs 7,00,000/8,000=Rs 87.5 per ton)		1,75,000	1,75,000
Production fixed overhead			2,70,000
Distribution variable overhead (Rs 2,00,000/8,000= Rs 25 per ton)	50,000	50,000	50,000
Administration overhead	1,00,000	1,00,000	1,00,000
Selling and distribution overhead	2,00,000	2,00,000	2,00,000
	44,50,000	52,75,000	45,45,000
Additional profit/ loss	5,50,000	(2,75,000)	4,55,000
Original budgeted profit	20,00,000	20,00,000	20,00,000

(ii)   Revised operating budget based on subcontract:

	Rs' 000	Rs '000
Sales:10,000 tons @Rs 2,500 per ton		2,500
Variable costs		
Materials	300	
Direct wages	1,200	
Subcontract	410	
Production overhead 50% variable	70	
Total production variable cost	1,980	
Distribution – 20% variable	25	2,005
Contribution		495
Fixed costs		
Production	70	
Administration	70	
Selling and distribution	10	240
Profit		255

Q21. Two competing companies ABC Ltd. and XYZ Ltd. produce…..

Solution:

	ABC	XYZ
1. PV Ratio = (Contribution/Sales)	50000/250000	100000/250000
	=20%	=40%
2. Breakeven Sales = (Fixed Cost/Cpu)	25000/20%	75000/40%
	=125000	= 187500

(a) If low demand scenario is expected then Co. ABC Ltd is expected to earn greater profits because :-

- ✓ It has lower FC
- ✓ It has lower BEP

(b) If high demand scenario is expected then Co. XYZ Ltd. is expected to earn greater profits because :-

- ✓ It has higher PV Ratio – although BEP is higher still after a certain level of sales an additional ₹ of sales revenue will add more to the contribution & hence to the Profit as compared to Co. ABC Ltd.

UNIT VII: SELL OR FURTHER PROCESS

Q.1   Inorganic Chemicals purchases…

Solution
1.
(a)   Sales value at split off method

Products	Sales in tonnes (a)	Selling price per tonne (₹) (b)	Sales revenue (₹) (c)=(a) × (b)	Joint cost apportioned* (₹)
Caustic Soda	2,400	100	2,40,000	1,00,000
Chlorine	1,600	150	2,40,000	1,00,000
			4,80,000	2,00,000

* Apportioned joint cost $= \dfrac{\text{Total joint cost}}{\text{Total sale value}}$ x Sale revenue of each product

Joint cost apportioned to Caustic Soda $= \dfrac{₹2,40,000}{₹4,80,000}$ x ₹2,00,000 = ₹1,00,000

Joint cost apportioned to Chlorine $= \dfrac{₹2,40,000}{₹4,80,000}$ x ₹2,00,000 = ₹1,00,000

(b)   Physical Measure Method

Products	Sale in (tonnes)	Joint cost (₹) apportioned **
Caustic Soda	2,400	1,20,000
Chlorine	1,600	80,000
	4,000	2,00,000

**Apportioned joint cost $= \dfrac{\text{Total joint cost}}{\text{Total physical value}}$ x Physical units of each product

Joint cost apportioned to Caustic Soda $= \dfrac{₹2,00,000}{4,000 \text{ tonnes}}$ x 2,400 tonnes = ₹1,20,000

Joint cost apportioned to chlorine $= \dfrac{₹2,00,000}{4,000 \text{ tonnes}}$ x 1,600 tonnes = ₹80,000

(c)   Estimated net realisable value method

Products	Sale Revenue (₹) (a)	Further Processing cost (₹) (b)	Net realisable Value (₹) (c) = (a) − (b)	Apportioned*** Joint cost (₹)
Caustic Soda (2,400 tonnes × ₹100)	2,40,000	-	2,40,000	80,000
Chlorine (Using PVC's Revenue)	4,00,000	40,000	3,60,000	1,20,000
			6,00,000	2,00,000

**Apportioned joint cost = $\frac{\text{Total joint cost}}{\text{Total net realisable value}}$ x Net realisable value of each Product

Apportioned joint cost for Caustic Soda = $\frac{₹2,40,000}{₹6,00,000}$ x ₹2,00,000 = ₹80,000

Apportioned joint cost for Chlorine = $\frac{₹2,40,000}{₹6,00,000}$ x ₹2,0,000 = ₹1,20,000

2.   Calculation of Gross Margin Percentage

Particulars	Caustic soda	PVC
(i) Sales value at Split off:		
Sales Revenue	240000	400000
Less: Further Processing Cost	-	40000
Less: Joint Cost	100000	100000
Gross Profit	140000	260000
Gross Margin %	58.33%	65%
(ii) Physical Measure:		
Sales revenue	240000	400000
Less: Further processing cost	-	40000
Less: Joint Cost	120000	80000
Gross Profit	120000	280000
Gross Margin %	50%	70%
(iii) Net Realizable Value:		
Sales revenue	240000	400000
Less: Further Processing Cost	-	40000
Less: Joint cost	80000	120000
Gross Profit	16000	240000
Gross Margin %	66.67%	60%

3. Incremental revenue from further
    processing of Chlorine into PVC   ₹1,60,000
    (1000 tonnes × ₹400 – 1600 tonnes × ₹150)
    Less: Incremental cost of further processing of Chlorine into PVC   ₹ 40,000
    Incremental operating income from further processing   ₹1,20,000

The operating income of Inorganic Chemicals will be reduced by ₹1,20,000 in August if it sells 1,600 tonnes of Chlorine to Lifetime Swimming Pool Products, instead of further processing of Chlorine into PVC for sale.

Q.3 Pigments Ltd. is a chemical factory……………..

Solution

Particulars	Option – I Process L to M	Option – II Sell new product A
	Amount (₹)	Amount (₹)
Sale of Product M	648,000	
Sale of Product A		210000
(Less: Revenue lost on Product L)	400,000	
(Less: Revenue lost on Product J)		35000
Less: Additional Cost	180,000	84000
Incremental Profit	68000	91000
Decision : Option II is better by ₹ 23000		

UNIT VII: SHUT DOWN POINT

Q.1   Crocodile, a company manufacturing……

Shutdown point $= \dfrac{\text{Avoidable FC} - \text{Cost of shutdown}}{\text{Cpu}}$

$= \dfrac{5,00,000 - 1,00,000}{100}$

= 4000 units

Company should **continue** the operations since expected activity level (5000 units) > shutdown point (4000 units)

<u>If Cpu changes to ₹ 60 pu</u>

Shutdown point $= \dfrac{5,00,000 - 1,00,000}{60}$

= 6667

Company should **Shutdown** the operations since expected activity level (5000 units) < shutdown point (6667 units)

Q.2   Sony Ltd. manufacturing 20,000……

Evolution of both the Alternatives

Particulars	If Continue	If Shutdown
No. of units	2000 units	-
Sales revenue @ 20,000	4,00,00,000	-
Less: Variable cost @13,000	2,60,00,000	-
Contribution	1,40,00,000	-
Less: Fixed cost	8,00,00,000	3,30,00,000
Less: Additional Shutdown cost	-	1,20,00,000
Profit / (loss)	(6,60,00,000)	(4,50,00,000)

Company should **shutdown** the operations since it results in lower amount of losses.

Shutdown Point $= \dfrac{\text{Avoidable FC} - \text{cost to shutdown}}{\text{cpu}}$

$= \dfrac{4,70,00,000 - 1,20,00,000}{7000}$

= 5000 units

Q.4   Sumukha Ltd. which manufactures the….

Solution

Calculation of Variable Costs, Break Even Sales, Profit and Fixed Cost for the Year 20X2

Sales for the year 20X2	Rs. 6,00,000
Profit Volume Ratio	25%
Contribution = Sales x P/V Ratio	Rs. 1,50,000
Variable Cost = Sales – Contribution	Rs. 4,50,000
Margin of Safety	20%
Margin of Safety = Sales x 20% i.e. Rs. 6,00,000 x $\frac{20}{100}$	Rs. 1,20,000
Break Even Sales = Sales - Margin of safety	Rs. 4,80,000 (Rs. 6,00,000 – Rs. 1,20,000)
Profit = Margin of Safety x P/V Ratio	Rs. 30,000 (Rs. 1,20,000 x 25%)
Fixed Cost = Contribution - Profit	Rs. 1,20,000 (Rs. 1,50,000 - Rs. 30,000)

Computation of Sales, Break Even Sales and Fixed Cost for 20X3

Let the sales for the year 20X3 be X and the Variable Cost for the year is Rs. 4,50,000. same as in the year 20X2

Contribution = x - Rs. 4,50,000

P/V Ratio (Given) = 20%

20% of Sales = x - Rs. 4,50,000

Or 20% of = x – x - Rs. 4,50,000

Or $\frac{20}{100} = \frac{x - Rs.4,50,000}{x}$

Or $\frac{20}{100} = \frac{x - Rs.4,50,000}{x}$

Or   0.80x = Rs.4,50,000

Or   x = Rs.4,50,000 x $\frac{100}{80}$ = Rs.5,62,500

Sales = Rs. 5,62,500

Margin of Safety = 30%

Margin of Safety = Rs. 5,62,500 x $\frac{30}{100}$ = Rs. 1,68,750

Break Even Sales   = Sales - Margin of Safety
                    = Rs. 5,62,500 - Rs. 1,68,750 = Rs. 3,93,750

Break Even Sales   = $\frac{Fixed\ Cost}{P/V\ Ratio}$

Or   Fixed Cost   = P/V Ratio x Break Even Sales

                    = 20% x Rs. 3,93,750 = Rs. 78,750

(i)   COMPARATIVE STATEMENT OF SALES AND PROFIT UNDER MARGINAL
COSTING

for the years 20X2 and 20X3

	20X2	20X3
	Rs.	Rs.
Sales	6,00,000	5,62,500
Less: Variable Cost	4,50,000	4,50,000
Contribution	1,50,000	1,12,500
Less: Fixed Cost	1,20,000	78,750
Profit	30,000	33,750

(ii)   Minimum Sales Required (if the company decides to shut-down its unit in 20X3)

Minimum Sales Required $= \dfrac{\text{Avoidable Fixed Cost}}{\text{P/V Ratio}}$

$= \dfrac{\text{Rs.}78{,}750 - \text{Rs.}60{,}000}{20\%} = $ Rs. 93,750