

CVP ANALYSIS AND DECISION MAKING

Question 1

6000 pen drives of 2 GB to be sold in a perfectly competitive market to earn ₹ 1,06,000 profit, whereas in a monopoly market only 1200 units are required to be sold to earn the same profit. The fixed costs for the period are ₹ 74,000 . the contribution per unit in the monopoly market is as high as three fourths its variable cost. Determine the targets selling price per unit under each market condition.
(4 Marks) (May, 2011)

Answer

	Perfect Competition	Monopoly
Units	6,000	1,200
Contribution (1,06,000 + 74,000)	1,80,000	1,80,000
Contribution per unit	30	150
Variable Cost per unit 150 , $\frac{3}{4}$		200
Variable Cost per unit	200	
Selling Price per unit	230	350

Question 2

Paints Ltd. manufactures 2,00,000 tins of paint at normal capacity. It incurs the following manufacturing costs per unit:

	₹
Direct material	7.80
Direct labour	2.10
Variable overhead	2.50
Fixed overhead	<u>4.00</u>
Production cost / unit	<u>16.40</u>

Each unit is sold for ₹ 21, with an additional variable selling overhead incurred at ₹ 0.60 per unit.

During the next quarter, only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to ₹ 74,000 for the quarter.

When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shut down for the quarter are estimated at ₹ 14,000.

You are required:

- (i) To advise whether it is more economical to shut down the plant during the quarter rather than operate the plant.
- (ii) Calculate the shut down point for the quarter in terms of numbering units.

(6 Marks) (Nov., 2008)

Answer

Contribution per tin = Selling Price – Variable cost
 = 21 – (7.8 + 2.1 + 2.5 + 0.6)
 = ₹ 8 per tin.

Loss on operation:

Fixed cost per annum = 2,00,000 units ÷ 4 per unit = 8 lakhs.

∴ Fixed cost for 1 quarter = $\frac{8}{4}$ = 2 lakhs

	₹
Fixed cost for the quarter	2,00,000
Less: Contribution on operation (8 × 10,000)	<u>80,000</u>
Expected loss on operation	<u>(1,20,000)</u>

Loss on shut down:

	₹
Unavoidable Fixed Cost	74,000
Additional shut down cost	<u>14,000</u>
Loss on shut-down	<u>(88,000)</u>

Conclusion: Better to shut down and save ₹ 32,000.

$$\begin{aligned}
 \text{Shut-down point (number of units)} &= \frac{\text{Avoidable Fixed Cost}}{\text{Contribution per unit}} \\
 &= \frac{2,00,000 - 88,000}{8} \\
 &= \frac{1,12,000}{8} = 14,000 \text{ units.}
 \end{aligned}$$

Question 3

Vikram Ltd. produces 4 products using 3 different machines. Machine capacity is limited to 3,000 hours for each machine. The following information is available for February, 2009

Products	A	B	C	D
Contribution (Sales-direct material) ₹	1,500	1,200	1,000	600
Machine Hours Required/Unit :				
Machine 1	10	6	2	1
Machine 2	10	9	3	1.5
Machine 3	10	3	1	0.5
Estimated Demand (units)	200	200	200	200

From the above information you are required to identify the bottleneck activity and allocate the machine time. (7 Marks)(June, 2009)

Answer

Machine	Time required for products				Total Time	Time Available	Machine utilization
	A	B	C	D			
1	2000	1200	400	200	3800	3000	126.67%
2	2000	1800	600	300	4700	3000	156.67%
3	2000	600	200	100	2900	3000	96.67%

Since Machine 2 has the highest machine Utilization it represents the bottleneck activity hence product, ranking & resource allocation should be based on contribution/machine hour of Machine 2.

Allocation of Resources						
	A	B	C	D	Machine Utilization	Spare Capacity
Contribution per unit (₹)	1500	1200	1000	600		
Time required in Machine 2	10	9	3	1.5		

Contribution per Machine – hour (₹)	150	133.33	333.33	400		
Rank as per contribution / mach. Hour	3 rd	4 th	2 nd	1 st		
Allocation of Machine 2 time	200×10 = 2000	100 (balancing figure)	200×3 = 600	200×1.5 = 300	3000	
Production Quantity	200	100/9=11.1 1	200	200		
Allocation Machine 1 time	2000	11.11×6 = 66.66	400	200	2666.66	333.34
Allocation of Machine 3 time	2000	11.11×3 = 33.33	200	100	2333.33	666.67

Question 4

G Ltd. produces and sells 95,000 units of 'X' in a year at its 80% production capacity. The selling price of product is ₹ 8 per unit. The variable cost is 75% of sales price per unit. The fixed cost is ₹ 3,50,000. The company is continuously incurring losses and management plans to shut-down the plant. The fixed cost is expected to be reduced to ₹1,30,000. Additional costs of plant shut-down are expected at ₹15,000.

Should the plant be shut-down? What is the capacity level of production of shut-down point?

(5 Marks)(Nov., 2010)

Answer

	If plant is continued	If plant is shutdown
Sales	7,60,000	-
Less: Variable Cost	<u>5,70,000</u>	-
Contribution	1,90,000	
Less: Fixed Cost	3,50,000	1,30,000
Additional Cost		<u>15,000</u>
Operating Loss	<u>1,60,000</u>	<u>1,45,000</u>

A comparison of loss figures indicated as above points out that loss is reduced by (16,000-14,500) ₹ 15,000 if plant is shut down.

$$\text{Shut down point} = \frac{3,50,000 - 14,5000}{8 - 6} = \frac{20,500}{2} = 1,02,500 \text{ units}$$

Capacity level of shut down point:

At 100% level production is $\frac{95,000}{0.80} = 1,18,750$

Capacity level at shut down = $\frac{1,02,500}{1,18,750} = 86.31\%$

Alternative Solution

	₹
If the plant is shut down, the sunk cost or fixed expenses	1,45,000
If it is working at 80% capacity, the fixed cost	3,50,000
Additional fixed expenses	2,05,000
Contribution (95000*2)	1,90,000
Incremental Loss on Continuing	15,000

Decision - better to shut down

Production at shut-down point

$2x - 350000 = 1,45,000$

$2x = 2,05,000$

$x = 1,02,500 \text{ Units}$

Capacity % = $1,02,500 / (95,000 / 0.8) = 86.31\%$

Question 5

E Ltd. manufactures and sells four types of products under the brand names A, B, C and D. On a turnover of ₹ 30 crores in 2009, company earned a profit of 10% before interest and depreciation which are fixed. The details of product mix and other information are as follows:

Products	Mix% to total sales	PV Ratio (5)	Raw material as % on sales value
A	30	20	35
B	10	30	40
C	20	40	50
D	40	10	60

Interest and depreciation amounted to ₹225 lakhs and ₹ 115.50 lakhs respectively. Due to increase in prices in the international market, the company anticipates that the cost of raw materials which are imported will increase by 10% during 2010. The company has been able to secure a license for the import of raw materials of a value of ₹ 1,535 lakhs at 2010 prices. In order to counteract the increase in costs of raw materials, the company is contemplating to

revise its product mix. The market survey report indicates that the sales potential of each of the products: 'A', 'B' and 'C' can be increased upto 30% of total sales value of 2009. There was no inventory of finished goods or work in progress in both the year.

You are required to :

Set an optimal product mix for 2010 and find the profitability. (12 Marks)(Nov., 2010)

Answer

Revised P/V ratio and ranking of products:

Product	Existing P/V ratio %	Increase in Raw material cost as % of sales value	Revised P/V Ratio	Revised raw material as % of sale value	Contribution per ₹ 100 of raw material %	Rank
A	20	3.5	16.5	38.50	42.86%	III
B	30	4	26	44.00	59.09%	II
C	40	5	35	55.00	63.64%	I
D	10	6	4	66.00	6.06%	IV

Maximum Sales potential

A	30 % ₹ 3000	900
B	30 % ₹ 3000	900
C	30 % ₹ 3000	900
D	40 % of 3000	1200

Allocation of raw material whose supply is restricted to ₹ 1535 lacs in order of raw material profitability.

Product	Rank	Sales Rs. In lacs	Raw Material per ₹ 100 Lacs Sales	Raw Material Equired	Balance Raw Material
C	I	900	55	495	1040
B	II	900	44	396	644
A	III	900	38.5	346.5	297.5
D	IV	451**	66	297.5*	0

* Balancing figure, hence sales will be restricted to 451** lakhs (297.5/66%)

Profitability Statement				₹ In Lakhs		
Product	Existing (2009)			Proposed(2010)		
	Sales	P/V Ratio	Contribution	Sales	P/V Ratio	Contribution
A	900	20	180	900	16.5	148.5
B	300	30	90	900	26	234
C	600	40	240	900	35	315
D	1200	10	120	451	4	18.04
Total	3000		¹ 630	3151		³ 715.54
Less : Fixed Costs*			² 330			
Profit before Dep and Int.			300			
Less :Depreciation			225			
Less :Interest			115.5			
Profit before tax			(40.5)			

* Balancing figure(Contribution - Profit before Depreciation & Interest)

The increase of contribution of ₹85.54 in 2010 will set off loss of ₹40.50 lakhs and result in profit of ₹45.04 lakhs.

Question 6

The following information is given by Z Ltd.:

Margin of safety	₹ 1,87,500
Total cost	₹ 1,93,750
Margin of safety	7500 units
Break-even sales	2500 units

Required:

Calculate Profit, P/V Ratio, BEP Sales (in ₹) and Fixed Cost. (4 Marks)(Nov., 2010)

Answer

Margin of Safety(%)	= MoS Units/Actual Sales Units
	= 7500/(7500+2500)
	= 75%
Total Sales	= 187500/0.75
	= ₹ 2,50,000/-

Profit	= Total sales – Total Cost
	= 250000 – 193750
	= ₹ 56250
P/V Ratio	= Profit/MoS (₹) ´ 100
	= 56250/187500 ´ 100 = 30%
BEP Sales	= Total Sales / (100 – MS)
	= 2,50,000 ´ 0.25
	= ₹ 62,500
Fixed Cost	= Sales x P/V Ratio
	= 250000 ´ 0.30-56250
	= 18750

Alternate Answer 1

Margin of Safety	=	Selling Price per unit ´ (7500 units)
₹ 187500	=	Selling Price per unit ´ (7500 units)

Therefore ,

Selling Price per unit =	187500/7500	= ₹ 25
Profit		₹
Sales	10000 ´ 25	2,50,000
Less: Total Cost		1,93,750
Profit		56,250
P/V Ratio	Profit/Margin of Safety	
	56250/187500=	30%
BEP Sales	2500 ´ 25	₹ 62,500
Fixed Cost	62500 ´ 30%=	₹ 18,750

Alternative Answer 2

Selling price = ₹ 187500/ 7500 = ₹ 25

Total Cost at Break Even point= ₹ 25 ´ 2500 = 62500 = Break Even Sales

(Total Cost – Total Cost of BE)/(Total Units – Break Even Units) = Variable Cost per Unit

(93,750 – 62,500)/(10,000 – 2,500) = 1,31,250/7,500 = ₹ 17.50 per unit

Selling Price	= 25.00
Variable Cost	= <u>17.50</u>
Contribution	= 7.50
P/V Ratio	= 7.50/25
	= 30%
Fixed Cost	= 7.50 × 2500 units
	= ₹ 18750.
Profit	= 7.50 × 7500
	= ₹ 56,250

Question 7

Calculate the selling price per unit to earn a return of 12% net on capital employed (net of tax @40%). The cost of production and sales of 80,000 units are:

Variable cost including material cost ₹ 9,60,000

Fixed overheads ₹ 5,00,000

The fixed portion of capital employed is ₹ 12 lakhs and the varying portion is 50% of sales turnover. (4 Marks)(Nov., 2010)

Answer

Let 'x' be the selling price per unit, Therefore, Turnover = 80000 x

Capital Employed = 1200000 + 40000 x

Return on capital employed after tax = 12%

Therefore,

Return on capital employed before tax = 12/0.6

= 20%

Therefore,

Return on capital employed before tax = 20% of (1200000 + 40000x) = 240000 + 8000x

Sales	80000 x
Variable Cost	960000
Fixed Cost	500000
Profit	80000x – 1460000

Therefore

$$\begin{aligned} 80000x - 1460000 &= 240000 + 8000x \\ 72000x &= 1700000 \\ X &= \text{Rs. 23.61} \end{aligned}$$

Alternative Answer

Selling price per unit should cover Variable cost unit, Fixed Cost per unit and ROCE per unit

Fixed Capital Employed = ₹ 12 lacs

Required Return (net of tax) = 12% = ₹ 1,44,000

Pre tax return = 1,44,000 / 0.6 = ₹ 2,40,000

Let Selling Price per unit = X

$$\begin{aligned} X &= (14,60,000 + 2,40,000) / 20,000 + (12\% \text{ of } 50\% \text{ of } X) / 0.6 \\ &= 17,00,000 / 20,000 + 6 / 100 \times 1 / 0.6 \times X \end{aligned}$$

$$X(1 - 0.1) = 21.25$$

$$X = 21.25 / 0.9 = ₹ 23.61 \text{ per unit}$$

Required Selling price = ₹ 23.61

If a student has arrived at ₹ 23.61, full 4 marks may be given even if the intermediary steps are not adequately shown.

Question 8

Entertain U Ltd. hires an air-conditioned theatre to stage plays on weekend evenings. One play is staged per evening. The following are the seating arrangements:

VIP rows-the first 3 rows of 30 seats per row, priced at ₹ 320 per seat.

Middle level-the next 18 rows of 20 seats per row priced at ₹ 250 per seat.

Last level -6 rows of 30 seats per row priced at ₹ 120 per seat.

For each evening a drama troupe has to be hired at ₹ 71,000, rent has to be paid for the theatre at ₹ 14,000 per evening and air conditioning and other stage arrangements charges work out to ₹ 7,400 per evening. Every time a play is staged, the drama troupe's friends and guests occupy the first row of the VIP class, free of charge, by virtue of passes granted to these guests. The troupe ensures that 50% of the remaining seats of the VIP class and 50% of the seats of the other two classes are sold to outsiders in advance and the money is passed on to Entertain U. The troupe also finds for every evening, a sponsor who puts up his advertisements banner near the stage and pays Entertain U a sum of ₹ 9,000 per evening. Entertain U supplies snacks during the interval free of charge to all the guests in the hall, including the VIP free guests. The snacks cost Entertain U ₹ 20 per person. Entertain U sells the remaining tickets and observes that for every

$$\backslash \quad \text{Break Even Point for Entertainment} = ₹ \frac{30,000}{200} = 150 \text{ No. of seats}$$

	VIP Rows	Middle Level	Last Level	
BF Seats Total 150	30	90	30	
Contribution per unit	300	200	100	
Contribution (₹)	<u>9,000</u>	<u>18,000</u>	<u>3,000</u>	₹ 30,000

Category wise occupancy at Break Even Point

VIP 30+30+30 = 90

Middle = 90+180 = 270

Last = 120

(ii) If demand is in the ratio 2 : 2 : 5

$$\text{Weighted contribution per seats} = \frac{2 \times 300 + 2 \times 200 + 5 \times 100}{9}$$

$$= \frac{600 + 400 + 500}{9} = \frac{1500}{9} = \frac{30,000}{1,500} \times 9 = 180 \text{ seats}$$

Ratio	40	40	100
Quantity available	30	180	90
Break Even quantity	30	10	90
		10	10
	30	60	90
Contribution per unit	300	200	100
No. of seats	30	60	90
Contribution Rs.	<u>9,000</u>	<u>12,000</u>	<u>9,000</u>

Total = 30,000