

COST CONCEPTS IN DECISION MAKING

Question 1

Explain briefly the concepts of Opportunity costs and Relevant costs. (4 Marks)(June, 2009)

Answer

Opportunity cost is a measure of the benefit of opportunity forgone when various alternatives are considered.

Or

It is the cost of sacrifice made by alternative action chosen.

E.g. opportunity cost of funds invested in business is the interest that could have been earned by investing the funds in bank deposit.

Relevant Cost:

Expected future costs which differ for alternative course.

(Or)

It is not essential that all variable costs are relevant and all fixed costs are irrelevant. Fixed, or variable costs that differ for various alternatives are relevant costs. Relevant costs draw our attention to those elements of cost which are relevant for the decision.

E.g. Direct labour under alternative I – ₹ 10/ hour

Direct labour under alternative II – ₹ 20/hour

Then, direct labour is relevant cost.

Question 2

What are the applications of incremental/differential costs? (5 Marks)(May, 2010)

Answer

Applications of Incremental/Differential Cost:

1. Whether to process a product further or not.
2. Dropping or adding a product line.
3. Optimizing investment plan.
4. accepting an additional order from a special customer at lower than existing price.
5. Make or buy decision.
6. Opening a new sales territory or branch.
7. Optimizing investment plan out of multiple alternatives.
8. Submitting tenders.
9. Lease or buy decisions.
10. Equipment replacement decisions.

Question 3

Pick out from each of the following items, costs that can be classified under 'committed fixed costs' or 'discretionary fixed costs'.

- (i) *Annual increase of salary and wages of administrative staff by 5% as per agreement*
- (ii) *New advertisement for existing products is recommended by the Marketing Department for achieving sales quantities that were budgeted for at the beginning of the year.*
- (iii) *Rents paid for the factory premises for the past 6 months and the rents payable for the next six months. Production is going on in the factory.*
- (iv) *Research costs on a product that has reached 'maturity' phase in its life cycle and the research costs which may be needed on introducing a cheaper substitute into the market for facing competition.*
- (v) *Legal consultancy fees payable for patent rights on anew product Patenting rights have been applied for.*

(5 Marks)(May 2011)

Answer

Committed Fixed Cost	Discretionary Fixed Cost
(i) Salary and wage increase	(ii) New Advertisement Cost
(iii) Rents payable for the next 6 months	(iv) Research cost for substitutes
(v) Legal fees for filing for patent rights.	

Question 4

XYZ Ltd. has two divisions, A and B. Division A makes and sells product A, which can be sold outside as well as be used by B. A has a limitation on production capacity, that only 1,200 units can pass through its machining operations in one month. On an average, about 10% of the units that A produces are defective. It may be assumed that out of each lot that A supplies, 10% are defectives.

When A sells in the outside market, the defectives are not returned, since the transportation costs make it uneconomical for the customer. Instead, A's customers sell the defectives in the outside market at a discount.

But, when B buys product A, it has to fix it into its product, which is reputed for its quality. Therefore, B returns all the defective units to A. A can manually rework the defectives, incurring only variable labour cost and sell them outside at ₹ 150 and not having to incur any selling costs on reworked units. If A chooses not to rework, it can only scrap the material at ₹ 30 per unit. B can buy product A from outside at ₹ 200 per unit, but has to incur ₹ 10 per unit as variable transport cost. B can insist to its outside suppliers also that it will accept only good units.

A incurs a variable selling overhead only on units (other than reworked units) sold outside. The following figures are given for the month:

Variable cost of production – Dept. A (₹/unit)	120
Variable selling overhead (₹/u)	20
Selling price per unit in the outside market (₹/u)	200
Current selling price to B (₹/u)	190
Additional variable labour cost of reworking defectives (₹/u)	100
Selling price of reworked defectives (₹/u)	150
Fixed costs for the month (₹)	36,000
Maximum demand from B at present (no. of units)	630

The outside demand can be freely had upto 900units.

Given the demand and supply conditions, you are required to present appropriate calculations for the following:

- (i) Evaluation of the best strategy for A in the present condition.
- (ii) If B can buy only upto 540 units and the outside demand is only 600 units, how much should A charge B to maintain the same level of profit as in (i) above?

(12 Marks)(June, 2009)

Answer

- (i) Contribution per unit against sale to outside = ₹ (200-120-20) = ₹ 60

In case of transfer, good units and rejected units are in proportion of 9:1

In case of transfer, contribution per good unit = ₹ (190 – 120) = ₹ 70

In case of transfer, contribution per rejected unit = ₹ (150 – 120-100) = ₹ -70

Thus, effective contribution per unit of transfer = ₹ (70 x 0.9 – 70x 0.1) = ₹ 56

As contribution per unit against outside sale is higher, the best strategy should be to sell maximum number of unit to outside marker.

Contribution from outside market from sale of 900 units = ₹ 54,000

₹ (900 x 60)

Contribution from transfer of 300 units to B = ₹ 16,800

₹ (300 x 56)

Total Contribution from best strategy = ₹ 70,800

- (ii) If B's demand is 540 unit, total production required = 600 units.

(540 /0.9)

Taking outside market demand of 600, it is within production capacity of 1200 units.

Now contribution from 600 units of outside sale = ₹ 36,000

₹ (600 x 60)

Contribution from rejected 60 units = ₹ (4,200)

₹ (60 x – 70)

= ₹ 31,800

To keep same level of contribution as in (i), the contribution required from transfer of 540 unit to B = ₹ 39,000

(₹ 70,800 – 31,800)

Thus, contribution required per unit = ₹ 72.22

₹ 39,000 /540

Hence price to be charged per unit against transfer to B = ₹ 192.2

₹ (120 + 72.22)

Alternative Solution:

Let x be the number of units sold outside and y be the number of units sold to B, before B returns 10% as defectives.

Then, $x + y = 1,200$, is the limitation on production capacity of A.

	Department A	
	Outside ₹	to B ₹
Selling Prices	200	190
Variable Cost – Production	120	120
Variable Cost – Sale	<u>20</u>	<u>--</u>
Total Variable Cost	<u>140</u>	<u>120</u>
Contribution	60	70

Contribution on x units sold outside = $60x$

Out of y units to B, $10\% = \frac{1}{10}y = .1y$ is returned to A. If A scraps, amount got = 30 per unit.

If A reworks and sells, it gets $150 - 100 = 50$ / unit.

\ Decision to reworks all defectives. i.e. $(.1)(y)$

Contribution on good units of B = $0.9y \times 70 = 63y$

Contribution on reworked units of B = $(.1)(y) \times 50 = 5y$

Amount of material lost on manufacture of defectives to B = $12y$

$(.1)(y) \times 120$

\ Contribution on y gross units transferred to B = $56y$

$63y + 5y - 12y$

Total contribution earned by A = $60x + 56y$

where $x + y = 1200$

To maximize contribution, maximize units sold outside.

\ 900 units – sell outside.

Balance $\frac{300}{1200}$ units (gross transfer to B, of which B gives back 30 defectives)

Contribution : ₹ 60 (900) + ₹ 56 (300)
= ₹ 54,000 + ₹ 16,800

Contribution = ₹ 70,800

Fixed Cost = ₹ 36,000

(i) Profit = ₹ 34,800

(ii) Outside demand = 600 units

Contribution = 600 × ₹ 60 = ₹ 36,000

Balance to be got = ₹ 34,800

= ₹ 70,800

Out of ₹ 34,800, defectives of B will give

₹ 3,000 60 × 50

₹ 31,800 charge to B for 540 units

Contribution to be obtained from 540 units of B = ₹ 31,800

Add: Production cost of 600 units @ 120/- = ₹ 72,000

Amount charged for 540 units = ₹ 1,03,800

∴ Price to be charged to B = $\frac{1,03,800}{540} = 192.22$

Per good unit transferred, to maintain the same level of profit as in (a).

Question 5

PQ Ltd. makes and sells a labour-intensive product. Its labour force has a learning rate of 80%, applicable only to direct labour and not to variable overhead.

The cost per unit of the first product is as follows:

Direct materials	10,000
Direct labour	8,000 (@ ₹ 4 per hour)
Variable overhead	<u>2,000</u>
Total variable cost	<u>20,000</u>

PQ Ltd. has received an order from X Ltd. for 4 units of the product. Another customer, Y Ltd. is also interested in purchasing 4 units of the product. PQ Ltd. has the capacity to fulfill both the orders. Y Ltd. presently purchases this product in the market for ₹ 17,200 and is willing to pay this price per unit of PQ's product. But X Ltd. lets PQ choose one of the following options:

(i) A price of ₹ 16,500 per unit for the 4 units it proposes to take from PQ.

Or

(ii) Supply X Ltd.'s idle labour force to PQ, for only 4 units of production, with PQ having to pay only Re. 1 per labour hour to X Ltd.'s workers. X Ltd.'s workers will be withdrawn after the first 4 units are produced. In this case, PQ need not use its labour for producing X Ltd.'s requirement. X Ltd. assures PQ that its labour force also has a learning rate of 80%. In this option, X Ltd. offers to buy the product from PQ at only ₹ 14,000 per unit.

X and Y shall not know of each other's offer.

If both orders came before any work started, what is the best option that PQ may choose?

Present suitable calculations in favour of your argument.

(8 Marks)(June, 2009)

Answer

Units	Average/ hrs/u.
1	2,000
2	1,600
4	1,280
8	1,024
Material Cost / u	= 10,000
Variable cost	= <u>2,000</u>
Variable Cost	= <u>12,000</u>

Option I

If both the orders came together, learning rate 80% applies and 8 units can be made, with average time of 1,024 hours per unit.

Cost to PQ:

Variable cost excl. labour	= ₹ 12,000
Labour cost 1,024 hrs × 4 ₹ /hr	= ₹ <u>4,096</u>
	= ₹ <u>16,096</u>

In this case,

	Y	X	
Selling Price p. u.	₹ 17,200	₹ 16,500	→ (under option I)
Variable Cost p. u.	<u>₹ 16,096</u>	<u>₹ 16,096</u>	
Contribution p. u.	₹ 1,104	₹ 404	

No. of units	4	4	
Contribution (₹)	4416	1616	6032

Option II

If X Ltd supplies its labour. 80% learning curve will apply to 4 units each of PQ & X.

Hence: hrs/ u = 1280

	Y	X	
Selling Price	₹ 17,200	₹ 14,000	
Variable Cost (excl. labour)	₹ 12,000	₹ 12,000	
Labour cost:			
1280 × 4	₹ 5,120		
1280 × 1		₹ 1280	
Total Variable Cost	<u>₹ 17,120</u>	<u>₹ 13,280</u>	
Contribution	₹ 80	₹ 720	
Units	4	4	
Contribution (₹)	320	2,880	3,200

PQ should not take labour from X Ltd. It should choose option I.

Question 6

Ret Ltd., a retail store buys computers from Comp Ltd. and sells them in retail. Comp Ltd. pays Ret Ltd. a commission of 10% on the _selling price at which Ret sells to the outside market. This commission is paid at the end of the month in which Ret Ltd. submits a bill for the commission. Ret Ltd. sells the computers to its customers at its store at ₹ 30,000 per piece. Comp Ltd. has a policy of not taking back computers once dispatched from its factory. Comp Ltd. sells a minimum of 100 computers to its customers.

Comp Ltd. charges prices to Ret Ltd. as follows:

₹ 29,000 per unit, for order quantity 100 units to 140 units.

₹ 26,000 per unit, for the entire order, if the quantity is 141 to 200 units. Ret Ltd. cannot order less than 100 or more than 200 units from Comp Ltd.

Due to the economic recession, Ret Ltd. will be forced to offer as a free gift, a digital camera costing it ₹ 4,500 per piece, which is compatible with the computer. These cameras are sold by another Co., Photo Ltd. only in boxes, where each box contains 50 units. Ret Ltd. can order the cameras only in boxes and these cameras cannot be sold without the computer.

In its own store, Ret Ltd. can sell 110 units of the computer. At another far of location, Ret Ltd. can sell upto 80 units of the computer (along with its free camera), provided it is willing to

spend ₹ 5,000 per unit on shipping costs. In this market also, the selling price that each unit will fetch is ₹ 30,000 per unit.

You are required to:

- State what is Ret's best strategy along with supporting calculations.
- Compute the break-even point in units, considering only the above costs.

(13 Marks)(June, 2009)

Answer

(a)

	Order Qty 100-140 (₹)	Order Qty 141-200 (₹)
Selling Price ₹ /u	30,000	30,000
Commission @ 10%	3,000	3,000
Sales revenue p. u.	33,000	33,000
Less: Variable purchase cost	29,000	26,000
Contribution / unit (before shipping)	4,000	7,000
Less: Shipping cost > 110 units		5,000
Contribution/ units after Shipping		2,000

- Upto 110 units, Reference will earn a contribution of ₹ 4,000/u.
- Between 110 & 140 units, contribution of 4,000 will be wiped out by 5,000 on shipping costs. Hence we should not consider 110 – 140 range.
- 101 – 110 not to be considered since additional fixed costs 2,25,000 will not be covered by 10 units.
- Valid consideration, 100 units or 141 to 190 units.

Fixed cost of box of 50 cameras is ₹ 2,25,000

Units		100	141	150	190
No. of Camera Boxes	A	2	3	3	4
Cost of Cameras (₹)	B	4,50,000	6,75,000	6,75,000	9,00,000
Contribution (₹ /u) ₹ 4,000	C	400,000			
Contribution (₹) first 110 units @ 7,000/u	D		7,70,000	7,70,000	7,70,000
Contribution (₹) Balance	E		62,000	80,000	1,60,000

units @ 2,000/u					
Total Contribution (F = C + D + E) (₹)	F	4,00,000	8,32,000	8,50,000	9,30,000
Profit (F) – (B) (₹)	G	- 50,000	1,57,000	1,75,000	30,000

Best strategy buy 150 units from Comp. sell 110 at store and 40 outside.

BEP should be between 151 – 191 units

Extra Camera box cost beyond 150 units = 2,25,000

Less: Profit for 150 units = 1,75,000

Extra profit acquired = 50,000

No. of units to cover this additional costs at contribution 2000 ₹ /u = $\frac{50,000}{2,000} = 25$

\ BEP = 150 + 25 = 175 units

Alternative Solution

The problem involves fixed cost of 50 Computers i.e ₹ 2,25,000 for incremental sale of 50.

	Units sold			
	110	140	150	190
Margin per unit = Sales price – buying price + commission (₹)	4000	4000	7000	7000
Margin (Excluding shipping cost)	4,40,000	5,60,000	10,50,000	13,30,000
Shipping cost (₹)		30 x 5000	40 x 5000	80 x 5000
For sale beyond 110 units		= 1,50,00	= 2,00,000	= 4,00,000
Contribution (₹)	4,40,000	4,10,000	8,50,000	9,30,000
Fixed cost (Cost of Computers)	6,75,000	6,75,000	6,75,000	9,00,000
Profit	-2,75,000	-2,65,000	1,75,000	30,000

Best strategy is sales level at 150 units.

The variations of profit is due to incremental fixed cost.

From the profits at different levels, it is seen that the BEP lies between 151 and 190.

Let BEP = X Units

Margin = 7000 X

Shipping Cost = (X -110)x 5000

Cost of Computers = ₹ 9,00,000

We have, $7000 X = (X - 110) \times 5000 + 900000$

Or $7X = 5X - 550 + 900$

Or $2X = 350$ or $X = 175$

Thus, BEP = 175 units.

Question 7

A company can make any one of the 3 products X, Y or Z in a year. It can exercise its option only at the beginning of each year.

Relevant information about the products for the next year is given below.

	X	Y	Z
Selling Price (₹/u)	10	12	12
Variable Costs (₹/u)	6	9	7
Market Demand (units)	3000	2000	1000
Production capacity (units)	2000	3000	900
Fixed Costs (₹)			30,000

You are required to compute the opportunity costs for each of the products.

(3 Marks) (May, 2011)

Answer

	X	Y	Z
Contribution per unit	4	3	5
Units (lower of production/ market demand)	2000	2000	900
Possible Contribution (₹)	8000	6000	4500
Opportunity Cost	6000	8000	8000

(Note: Opportunity cost is maximum benefit forgone.)

Question 8

Bloom Ltd. makes 3 products, A, B and C. The following information is available:

	(Figures in Rupees per unit)		
	A	B	C
Selling price (peak-season)	550	630	690

Selling price (off-season)	550	604	690
Material cost	230	260	290
Labour (peak-season)	110	120	150
Labour (off-season)	100	99	149
Variable production overhead	100	120	130
Variable selling overhead (only for peak-season)	10	20	15
Labour hours required for one unit of production	8	11	7 (hours)

Material cost and variable production overheads are the same for the peak-season and off-season. Variable selling overheads are not incurred in the off-season. Fixed costs amount to ₹ 26,780 for each season, of which ₹ 2,000 is towards salary for special technician, incurred only for product B, and ₹ 4,780 is the amount that will be incurred on after-sales warranty and free maintenance of only product C, to match competition.

Labour force can be interchangeably used for all the products. During peak-season, there is labour shortage and the maximum labour hours available are 1,617 hours. During off-season, labour is freely available, but demand is limited to 100 units of A, 115 units of B and 135 units of C, with production facility being limited to 215 units for A, B and C put together.

You are required to:

- (i) Advise the company about the best product mix during peak-season for maximum profit.
- (ii) What will be the maximum profit for the off-season? (12 Marks) (Nov., 2008)

Answer

Bloom Ltd.

Peak Season.

Statement of Contribution and BEP (in units)

Figures ₹

Product		A	B	C	
A.	Selling Price per unit	<u>550</u>	<u>630</u>	<u>690</u>	
	Variable Costs per unit:				
	Direct Material	230	260	290	

	Direct Labour	110	120	150	
	Variable Overhead – Production	100	120	130	
	Variable Overhead-Selling	<u>10</u>	<u>20</u>	<u>15</u>	
B.	Total Variable Cost	450	520	585	
C.	Contribution / unit (A – B)	100	110	105	
D.	Direct Labour hours / required per unit	8	11	7	
E.	Contribution per Labour Hour (C / D)	12.5	10	15	
F.	Ranking	2	3	1	
	General Fixed Overhead				20,000
	Specific Fixed overhead		2,000	4,780	<u>6,780</u>
G.	Total Fixed Overhead				26,780
H.	BEP (units) (for only 1 Product at a time) (G/C)	$\frac{20,000}{100} = 200$	$\frac{22,000}{110} = 200$	$\frac{24,780}{105} = 235$	

Maximum units that can be produced of product C with limited labour hours 1,617.

$$= \frac{1,617}{7} = 231.$$

231 < Break Even units.

Hence, Bloom Ltd. cannot produce C.

Next rank = A

Maximum units of A that can be produced with limited labour hours = $\frac{1,617}{8} = 202$ units. Break Even units of A = 200

\ Profit if only A is produced

	₹
Contribution = ₹ 202 × 100	20,200
Fixed Cost	<u>20,000</u>
Profit	<u>200</u>

Off Season

Bloom Ltd.

Off Season

Statement of Contribution and demand

Figures ₹ per unit

	Product	A	B	C	
A	Selling Price	550	604	690	
	Direct Material	230	260	290	
	Direct Labour	100	99	149	
	Production-Variable Overhead	<u>100</u>	<u>120</u>	<u>130</u>	
B	Total Variable Cost	430	479	569	
C	Contribution per unit (A - B)	120	125	121	
	Ranking	3	1	2	
	Maximum demand	100	115	135	
	Overall limit of production				215 units

Statement of profitability under different options

(limit of production = 215 units)

	A	B	C	Total	Fixed Cost	Profit (loss)
Contribution per unit	120	125	121	-		
Option 1: Units	-	115	100	215		
Contribution (₹)	-	14,375	12,100	26,475	26,780	(305)
Option 2: Units	100	115	-	215		
Contribution (₹)	12,000	14,375	-	26,375	22,000	4,375
Option 3: Units	80	-	135	215		
Contribution (₹)	9,600	-	16,335	25,935	24,780	1,155

Best strategy is to produce 100 units of product A and 115 units of product B during off-season.

Maximum profit = ₹ 4,375.

(i) Best strategy for peak-season is to produce 202 units of A.

- (ii) Maximum profit for off-season ₹ 4,375.

Question 9

A company has prepared the following budget for the forthcoming year:

	₹ lakhs
Sales	<u>20.00</u>
Direct materials	3.60
Direct labour	6.40
Factory overheads:	
Variable	2.20
Fixed	2.60
Administration overheads	1.80
Sales commission	1.00
Fixed selling overheads	<u>0.40</u>
Total costs	<u>18.00</u>
Profit	<u>2.00</u>

The policy of the company in fixing selling prices is to charge all overheads other than the prime costs on the basis of percentage of direct wages and to add a mark up of one-ninth of total costs for profit.

While the company is confident of achieving the budget drawn up as above, a new customer approached the company directly for execution of a special order. The direct materials and direct labour costs of the special order are estimated respectively at ₹ 36,000 and ₹ 64,000. This special order is in excess of the budgeted sales as envisaged above. The company submitted a quotation of ₹ 2,00,000 for the special order based on its policy. The new customer is willing to pay a price of ₹ 1,50,000 for the special order. The company is hesitant to accept the order below total cost as, according to the company management, it will lead to a loss.

You are required to state your arguments and advise the management on the acceptance of the special order. (7 Marks)(Nov., 2008)

Answer

Analysis of Cost and profit:

	₹ (lakhs)	₹ (lakhs)
Direct material	3.60	
Direct labour	<u>6.40</u>	

Prime cost		10.00
Overhead:		
Variable factory overhead	2.20	
Fixed factory overhead	2.60	
Administration overheads	1.80	
Selling commission	1.00	
Fixed selling overheads	<u>0.40</u>	<u>8.00</u>
Total cost		18.00
Profit		<u>2.00</u>
Rate of profit on costs (2/18) = 1/9		

Overhead absorption rate based on direct wages = $(8.00 / 6.40) \times 100 = 125\%$ of direct wages

Break up of new order:

	₹
Direct Materials	36,000
Direct Labour	64,000
Overheads 125% of direct wages	80,000
Total costs	1,80,000
Profit 1/9	20,000
Selling Price	2,00,000

The following points emerge:

- Factory overheads only are to be recovered on the basis of direct wages.
- The special order is a direct order. Hence commission is not payable.
- The budgeted sales are achieved. Hence all fixed overheads are recovered. Hence, no fixed overheads will be chargeable to the special order.

Based on the above, the factory variable overheads recovery rate may be calculated as under:

Total variable factory overheads ₹ 2.20 lakhs

Direct wages ₹ 6.40 lakhs

Factory overhead rate = $(2.20 / 6.40) \times 100 = 34.375\%$

Applying this rate the cost of the special order will be as under:

	₹
Direct materials	36,000

Direct labour	64,000
Overheads 34.375% of direct wages	22,000
Total costs	1,22,000
Price offered	1,50,000
Margin	28,000 (more than 1/9)

Hence, the order is acceptable at the price of ₹ 1,50,000.

Question 10

Lee Electronic manufactures four types of electronic products, A,B,C and D. All these products have a good demand in the market. The following figures are given to you:

	A	B	C	D
Material cost (₹/u)	64	72	45	56
Machining Cost (₹/u @ ₹ 8 per hour)	48	32	64	24
Other variable costs (₹/u)	32	36	44	20
Selling Price (₹/u)	162	156	173	118
Market Demand (Units)	52,000	48,500	26,500	30,000

Fixed overhead at different levels of operation are :

Level of operation (in production hours)	Total fixed cost (₹)
Upto 1,50,000	10,00,000
1,50,000 – 30,00,000	10,50,000
3,00,000 – 4,50,000	11,00,000
4,50,000- 6,00,000	11,50,000

At present, the available production capacity in the company is 4,98,000 machine hours. This capacity is not enough to meet the entire market demand and hence the production manager wants to increase the capacity. The company wants to retain the customers by meeting their demands through alternative ways. One alternative is to sub-contract a part of its production. The sub-contract offer received as under :

	A	B	C	D
Sub-contract Price (₹/u)	146	126	155	108

The company seeks your advice in terms of products and quantities to be produced and/or sub-contracted, so as to achieve the maximum possible profit. You are required to also compute the profit expected from your suggestion. (18 Marks)(Nov., 2009)

Answer

Demand	52,000	48,500	26,500	30,000
	A	B	C	D
Direct Material	64	72	45	56
M/c	48	32	64	24
Other Variable Cost	<u>32</u>	<u>36</u>	<u>44</u>	<u>20</u>
Total Variable Cost	<u>144</u>	<u>140</u>	<u>153</u>	<u>100</u>
Selling Price	162	156	173	118
Contribution (₹ /u)	18	16	20	18
M/s Hours per unit	6	4	8	3
Contribution (₹ / M/c hr.)	<u>3</u>	<u>4</u>	<u>2.5</u>	<u>6</u>
Ranking	III	II	IV	I
Sub-Contract Cost ₹ /u)	146	126	155	108
Contribution (₹ /u) on (Sub-Contract)	16	30	18	8

I Division: It is more profitable to sub-contract B, since contribution is higher sub-contract.

1st Level of Operations: 1,50,000 hours, Produce D as much as possible.

Hours required = 30,000 units × 3 = 90,000 hours

Balance hours available: 60,000 hours.

Produce the next best (i.e. A, Since B is better outsourced)

$\frac{60,000 \text{ hrs}}{6 \text{ hrs/u}} = 10,000 \text{ units of A.}$

1st Level of Operation:

		Contribution (units)	Contribution (₹)
A	Produce 10,000 units	18	1,80,000
A	Outsource 42,000 units	16	6,72,000
B	48,500 units		
	Outsource fully	30	14,55,000
C	26,500 units		
	Outsource fully	18	
D	30,000 units		
	Fully produce	18	5,40,000

Total Contribution:	33,24,000
Less: Fixed cost	10,00,000
Net Gain	23,24,000

2nd Level of Operation:

Both A and C increase contribution by own manufacture only by ₹ 2/- per unit. 1,50,000 hrs can produce 25,000 units of A.

\ Contribution increases by $25,000 \times 2 = 50,000$

(Difference in Contribution sub-contract and own manufacturing) = 2

But increase in fixed Cost = 50,000

At the 2nd level of operation, the increase in contribution by own manufacturing is exactly set up by increase in fixed costs by ₹ 50,000/-. It is a point of financial indifference, but other conditions like reliability or possibility of the sub-contractor increasing his price may be considered and decision may then be towards own manufacture.

3rd Level Additional: 1,50,000 hrs available

Unit of A that are needed = $[52,000 - 25,000 \text{ (2nd Level)} - 10,000 \text{ (1st Level)}]$

$= 17,000 \text{ units} \times 6 \text{ hrs/u} = 1,02,000 \text{ hrs.}$

Balance 48,000 hrs are available for C to produce 6,000 units.

Increase in Contribution over Level 1st or 2nd :

A: $17,000 \times 2 = ₹ 34,000$

C: $6,000 \times 2 = ₹ 12,000$

$= ₹ 46,000$

Increase in fixed costs $= ₹ 50,000$

Additional Loss $= ₹ 4,000$

4th Level Additional: 1,50,000 hrs can give $\frac{1,50,000}{8} = 18,750$ unit of C.

Increase in Contribution $18,750 \times 2 = ₹ 37,500$

Increase in Cost $= (₹ 50,000)$

Level 3rd loss c/fd $= (₹ 4,000)$

Level 1st profit will order by $= (₹ 16,500)$

Advice: Do not expand capacities; sell maximum

No. of units by operating at 1,50,000 hrs. capacity (level 1st) and gain ₹ 23,24,000.

Summary:

Product	Produce (Units)	Sub-Contract (Units)	Contribution (Production)	Contribution (Sub-Contract)	Total Contribution
A	10,000	42,000	1,80,000	6,72,000	8,52,000
B	-	48,500	-	14,55,000	14,55,000
C	-	26,500	-	4,77,000	4,77,000
D	30,000	-	5,40,000	-	5,40,000
					33,24,000
Fixed Cost					10,00,000
Profit					23,24,000

Question 11

E Ltd. is engaged in the manufacturing of three products in its factory. The following budget estimates are prepared for 2009-10 :

	Products		
	A	B	C
Sales (Units)	10,000	25,000	20,000
Selling price per unit. (₹)	40	75	85
Direct Materials per unit. (₹)	10	14	18
Direct wages per unit @ ₹ 2 p.hr.	8	12	10
Variable overhead per unit (₹)	8	9	10
Fixed overhead per unit (₹)	16	18	20
Profit/Loss	-2	22	27

After the finalisation of the above manufacturing schedule, it is observed that presently only 80% capacity being utilised by these three products. The production activities are made at the same platform and it may be interchangeable among products according to requirement. In order to improve the profitability of the company the following three proposals are put for consideration:

- (a) Discontinue product A and capacity released may be used for either product B or C or equally shared. The fixed cost of product A is avoidable. Expected changes in material cost and selling price subject to the utilisation of product A's capacity are as under:

Product B : Material cost increased by 10% and selling price reduced by 2%

Product C : Material cost increased by 5% and selling price reduced by 5%.

- (b) Discontinue product A and divert the capacity so released and the idle capacity to produce a new product D for meeting export demand whose per unit cost data are as follows:

	₹
Selling Price	60
Direct material	28
Direct wages @ ₹ 3 p. hr.	12
Variable overheads	6
Fixed cost (Total)	1,05,500

- (c) Product A, B and C are continuously run and hire out the idle capacity fixing a price in such a way that the same rate of profit per direct labour hour is obtained in the original budget estimates.

Required:

- Prepare a statement of profitability of products A, B and C in existing situation.
- Evaluate the above proposals independently and calculate the overall profitability of the company under each proposal.
- What proposal should be accepted, if the company wants to maximise its Profit?

(10 Marks)(May, 2010)

Answer

- (i) Budgeted profitability statement under existing situation

	A (₹)	B(₹)	C (₹)	Total
Selling price	40	75	85	
Total Variable costs (Direct Material + Direct Labour +Variable overhead)	<u>26</u>	<u>35</u>	<u>38</u>	
Contribution	<u>14</u>	<u>40</u>	<u>47</u>	
Sales units	10000	25000	20000	
Contribution in (₹)	140000	1000000	940000	2080000
Fixed cost (₹)	<u>160000</u>	<u>450000</u>	<u>400000</u>	<u>1010000</u>
Profit/loss (₹)	<u>-20000</u>	<u>550000</u>	<u>540000</u>	<u>1070000</u>

- (ii) Proposal (a) Alternative use of A's Capacity for Product B or C or B & C Equally

Hours released for discontinuance of A = 10,000 x 4 = 40,000 hours

	Product B	Product C	B & C
No of Units Possible	40000/ 6 = 6666	40000/ 5 = 80000	B=3333 C= 4000

Revised Contribution of Product B and Product C

Particulars	B (₹)	C (₹)
Selling price	73.50	80.75
Variable cost: Direct Material	15.40	18.90
Direct wages	12.00	10.00
Variable overheads	9.00	10.00
Total Variable cost	36.40	38.90
Contribution	37.10	41.85
Number of Hours	6	5
Contribution per hour	6.18	8.37

Decision : It is better to produce C

Taking both changes in the selling price and material cost are for the entire production or the incremental production. Profitability is calculated below:

Proposal (a) : Profitability statement if A's capacity utilized by C

Particulars	Option 1 Changes for entire production (₹)	Option 2 Changes for incremental production (₹)
Sales Volume	28000	8000
Contribution per unit	41.85	41.85
Total Contribution	1,17,1800	3,34,800
Less Fixed Cost	400000	0
Profit	771800	334800
Existing Profit of B	550000	550000
Existing Profit of C		540000
Total Profit	1321800	1424800

Proposal (b)

Existing capacity = (4 x 10,000 + 6 x 25,000 + 5x 20,000) = 290000 hrs

Then, Idle capacity of 20% = .290000 /4 = 72500 hours

Capacity for product 'D' = (idle + A's spare) capacity = 72500 + 40000 = 112500 hours,

No. of units 'D' produced = 112500/4 = 28125 units.

Profitability Statement – proposal (b)

Units	D (₹)
Selling price	60
Less : Variable cost : Direct Material	28
Direct wages	12
Variable Overheads	6
Contribution	14
Contribution amount (₹)	393750
Less fixed cost	105500
Profit	288250
Add : Existing Profit B & C	1090000
Total Profit	1378250

Proposal (c) Hiring Out idle capacity

Particulars	(₹)
Idle Hours	72,500
Existing Profit per hour (1070000/290000)	3.69
Revenue from Hire out	267500
Existing Profit	1070000
Total Profit	1337500

Profit Summary of alternatives (₹ in 000's)

Existing	Proposal(a) Option 1	Proposal (a) Option 2	Proposal (b)	Proposal (c)
1070.00	1321.80	1424.80	1378.25	1337.50

Decision on option on the basis of profitability :

- If price and cost under proposal (a) is for entire production of C: Proposal (b) of Export
- If price and cost under proposal (a) is for incremental prod C : Proposal (a) – Option 2

Question 12

X Ltd. supplies spare parts to an air craft company Y Ltd. The production capacity of X Ltd. facilitates production of any one spare part for a particular period of time. The following are the cost and other information for the production of the two different spare parts A and B:

Per unit	Part A	Part B
Alloy usage	1.6 kgs.	1.6 kgs.
Machine Time : Machine A	0.6 hrs.	0.25 hrs.
Machine Time : Machine B	0.5 hrs.	0.55 hrs.
Target Price (₹)	145	115

Total hours available : Machine A 4,000 hours

Machine B 4,500 hours

Alloy available is 13,000 kgs. @ ₹ 12.50 per kg.

Variable overheads per machine hours:

Machine A : ₹ 80

Machine B : ₹ 100

You are required to identify the spare part which will optimize contribution at the offered price.

If Y Ltd. reduces target price by 10% and offers ₹ 60 per hour of unutilized machine hour, what will be the total contribution from the spare part identified above?

(8 Marks)(May, 2010)

Answer

(i) Number of parts to be manufactured:

	Part A	Part B
Machine "A" (4,000 hours)	6666	16000
Machine "B" (4,500 hours)	9000	8181
Alloy available (13,000 hours)	8125	8125
Maximum number of parts to be manufactured	6666	8125
Cost per unit	₹	₹
Material (12.5 x 1.6)	20.00	20.00
Variable Overhead : Machine "A"	48.00	20.00
Variable Overhead: Machine "B"	50.00	55.00
Total variable cost per unit	118.00	95.00
Price offered	145.00	115.00
Contribution per unit	27.00	20.00
Total contribution for units produced (I)	179982	162500
Spare part A will optimize the contribution		

(ii)

	Part A
Parts to be manufactured numbers	6666
Machine A : to be used	4000
Machine B : to be used	3333
Underutilized machine hours (4500 – 3333)	1167
Compensation for unutilized machine hours (II) (₹ 1167 x 60)	70020
Reduction in price by 10% causing fall in contribution of ₹ 14.50 per unit i.e (₹ 6666 x 14.5) (III)	96657
Total contribution (I + II -III)	153345

Question 13

A company has two divisions : Division a and Division B. Both divisions of the company manufacture the same product but located at two different places. The annual output of division A is 6000 tons (at 80% capacity) and that of division B is 7500 tons (at 60% capacity). The basic raw material required for production is available locally at both the places, but at division A, it is limited to 4000 tons per annum at the rate of ₹ 100 per ton, at division B, it is limited to 8000 tons per annum at the rate of ₹110 per ton. Any additional requirement of material will have to be purchased at a rate of ₹ 125 per ton from other markets at either of division. Variable costs per ton at each division remain constant. For every 1000 tons of output, 800 tons raw material is required. The details of other costs of the divisions are as follows:

	Division A	Division B
Other variable costs of output (₹)	122 per ton	120 per ton
Fixed cost per annum(₹)	3,80,000	6,00,000

Required:

- Calculate variable cost per ton for each division's product and decide ranking in order to preference.
- The company desires to fully utilize the available local supplies of raw material to save the overall variable cost of production; keeping the total production of both the divisions putting together is the same as at present level. Calculate the quantity of production (output) that could be transferred between the two divisions and overall saving in variable cost.
- After considering the option (ii), how the balance capacity should be utilized if company is working at 100% capacity, and also calculate selling price per ton if company mark up 10% on full cost of each division's product. (12 Marks)(Nov., 2010)

Answer

Variable cost per ton in different alternatives

Particulars	Division A		Division B	
	Local	Outside	Local	Outside
Material per ton	0.8	0.8	0.8	0.8
Rate per ton	100	125	110	125
Cost of material	80	100	88	100
Other Variable cost per ton	122	122	120	120
Total Variable Cost	202	222	208	220
Ranking	I	IV	II	III

Maximum production at both divisions $6000 + 7500 = 13500$ tons

Rank	Division	Market	Material	Output	Total	Balance
I	A	Local	4,000	5,000	5,000	13,500
II	B	Local	6,800	8,500	13,500	8,500
	Total		10,800	13,500		0

Statement showing saving in overall variable cost of proposed mix

Production (Current Mix)	Production (tons)	Variable cost per ton	Amount (₹)
Division A from local Market	5,000	202	10,10,000
Division A from outside Market	1,000	222	2,22,000
Division B from local Market	7,500	208	15,60,000
Total Variable Cost of Production	13,500		27,92,000
Production (Proposed Mix)			
Division A from local Market	5,000	202	10,10,000
Transfer from Division A to B as variable cost in Division B is less than other market cost $(6000 - 5000) = 1000$ output required 800 tons input.	8,500	208	17,68,000
Total Variable Cost of Production	13,500		27,78,000

Transfer from Division A to Division B 1000 tons output will save in variable cost ₹ $2792000 - 2778000 = 14000$.

At 100% capacity the production is

	Div A	Div B	Total
Output (in tons)	$6000 / 0.80 = 7,500$	$7500 / 0.6 = 12,500$	20,000
Output already used	5,000	8,500	13,500
Balance capacity (tons)	2,500	4,000	6,500
Input required (tons)	6,000	10,000	

Input locally available	4,000	8,000	
Input locally used	4,000	6,800	
Balance available (input local)	NIL	1,200	

Rank	Div	Market	Material	Output	Total	Balance Output
						6500
2nd	B	Local	1200	1500	1500	5000
3rd	B	Outside	2000	2500	4000	2500
4th	A	Outside	2000	2500	2500	NIL

Total cost of production and Selling price per tone

	Division A	Amount (₹)	Division B	Amount (₹)
Variable Cost	Output x VC		Output x VC 8500+1500=10000	
Local Material	5000 × 202	10,10,000	× 208	20,80,000
Outside Material	2500 × 222	5,55,000	2500×220	5,50,000
Fixed Cost		3,80,000		6,00,000
TOTAL COST (full cost)		19,45,000		32,30,000
Profit		1,94,500		3,23,000
Selling Price		21,39,500		35,53,000
Selling Price per tonne		285.27		284.24

Alternative Answer

	Division A		Division B	
	Output	Raw Material	Output	Raw Material
Current production	6,000	4,800	7,500	6,000
Maximum Production	7,500		12,500	
Maximum production from Local Raw material	5,000	4,000	10,000	8,000

	Division A		Division B	
	Local Raw Material	Outside Raw Material	Local Raw Material	Outside Raw Material
Raw material cost per ton of output	80	100	88	100
Variable Overhead per ton of output	122	122	120	120

Total Variable Cost	202	222	208	220
Rank	I	IV	II	III
Current Mix (Output) M	5,000	1,000	7,500	-
Divisional subtotal of output	6,000		7,500	
Maximum Possible Output	5,000	2,500	10,000	2,500
Divisional subtotal of max. output	7,500		12,500	
Proposed optimal mix current output N	5,000	-	8,500	0

Savings in Variable Cost = $1000 \times (222-208) = 14,000$

(Difference between rows M and N)

	Division A		Division B	
	Local Raw Material	Outside Raw Material	Local Raw Material	Outside Raw Material
Maximum Prodn Capacity (Output)	5,000	2,500	10,000	2,500
Weighted average Variable Cost per tonne	$\frac{202 \times 2 + 222 \times 1}{3} = 208.67$		$\frac{208 \times 4 + 220 \times 1}{5} = 210.10$	

	Division A	Division B
Variable Cost per unit	208.67	210.40
Fixed Cost per unit	50.67	48.00
	380000/7500	600000/12500
Total Cost per ton	259.34	258.40
Markup @ 10%	25.93	25.84
Total Selling price per ton	285.27	284.24

Question 14

Maruthi Agencies has received an order from a valuable client for supplying 3,00,000 pieces of a component at ₹ 550 per unit at a uniform rate of 25000 units a month.

Variable manufacturing costs amount to ₹ 404.70 per unit, of which direct materials is ₹ 355 per unit. Fixed production overheads amount to ₹ 30 lacs per annum, including depreciation. There is a penalty/reward clause of ₹ 30 per unit for supplying less/more than 25000 units per month. To adhere to the schedule of supply, the company procured a machine worth ₹ 14.20 lacs which will wear out by the end of the year and will fetch ₹ 3.55 lakh at the year end. After this supply of machine, the supplier offers another advanced machine which will cost ₹ 10.65 lakhs, will wear out by the year end and not have any resale value. If

the advanced machine is purchased immediately, the purchaser will exchange the earlier machine supplied at the price of the new machine. Fixed costs of maintaining the advanced machine will increase by ₹ 14,200/- per month for the whole year. While the old machine had the capacity to complete the production in 1 year, the new machine can complete the entire job in 10 months. The new machine will have material wastage of 0.5% . assume uniform production throughout the year for both the machines.

Using incremental cost/revenue approach, decide whether the company should opt for the advanced version.
(5 Marks) (May, 2011)

Answer

	Old (₹)	New (₹)	Incremental
Depreciation ₹ 14.2 lakhs – ₹ 3.55 lakhs	10,65,000	10,65,000	-
Fixed Cost increase		1,70,400	(-) 1,70,400
Resale value	+3,55,000	-	(-) 3,55,000
Material ₹ /u 355 x .5% 1.775 x 3,00,000		5,32,500	(-) 5,32,500
Increase in Costs in new Machine purchased			(-) 10,57,900
Penalty @ ₹ 30 per unit	-	-	
Reward @ ₹ 30 per unit 5000 per months x 10 months = 50,000 x 30 =			+ 15,00,000
Gain			<u>4,42,100</u>

Decision: Buy the advanced version.

Working Note:

1st machine 25,000 per month, no penalty, no reward

new machine: $\frac{3,00,000}{10} = 30,000$ per months

advance supply per month = 5,000

= 5,000 x 10 months = 50,000 units reward.