

PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

Question Nos. 1 is compulsory.

Answer any five questions from the rest.

Working notes should form part of the answer.

Question 1

- (a) 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. (12 Marks)

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 Rs.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 Rs.30 per unit. B can buy product A from outside at Rs.200 per unit, but has to incur Rs.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 (Rs./unit)	120
Variable selling overhead (Rs./u)	20
Selling price per unit in the outside market (Rs./u)	200
Current selling price to B (Rs./u)	190
Additional variable labour cost of reworking defectives (Rs./u)	100
Selling price of reworked defectives (Rs./u)	150
Fixed costs for the month (Rs.)	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:

- Evaluation of the best strategy for A in the present condition.
- 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?

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- (b) 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. (8 Marks)

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

Direct materials	10,000
Direct labour	8,000 (@Rs.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 Rs.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 Rs.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 Rs.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.

Answer

1. (a) (i) Contribution per unit against sale to outside = Rs (200-120-20) = Rs 60
In case of transfer, good units and rejected units are in proportion of 9:1
In case of transfer, contribution per good unit = Rs (190 – 120) = Rs 70
In case of transfer, contribution per rejected unit = Rs (150 – 120-100) = Rs -70
Thus, effective contribution per unit of transfer = Rs (70 x 0.9 – 70x 0.1) = Rs 56
As contribution per unit against outside sale is higher, the best strategy should be to sell maximum number of unit to outside market.
Contribution from outside market from sale of 900 units = Rs 54,000
Rs.(900 x 60)

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

Rs (300 x 56)

Total Contribution from best strategy = Rs 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 = Rs 36,000

Rs (600 x 60)

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

Rs (60 x – 70)

= Rs 31,800

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

(Rs 70,800 – 31,800)

Thus, contribution required per unit = Rs 72.22

Rs 39,000 /540

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

Rs (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
	Rs.	Rs.
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		

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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 : Rs.60 (900) + Rs.56 (300)
 = Rs.54,000 + Rs.16,800

Contribution = Rs.70,800

Fixed Cost = Rs.36,000

(i) Profit = Rs.34,800

(ii) Outside demand = 600 units

Contribution = $600 \times \text{Rs.}60 = \text{Rs.}36,000$

Balance to be got = Rs.34,800

= Rs.70,800

Out of Rs.34,800, defectives of B will give

Rs. 3,000 60×50

Rs. 31,800 charge to B for 540 units

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

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

Amount charged for 540 units = Rs. 1,03,800

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$$\therefore \text{Price to be charged to B} = \frac{103,800}{540} = 192.22$$

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

(b) 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	= Rs.12,000
Labour cost 1,024 hrs × 4 Rs./hr	= Rs. <u>4,096</u>
	= Rs. <u>16,096</u>

In this case,

	Y	X	
Selling Price p. u.	Rs.17,200	Rs.16,500	→ (under option I)
Variable Cost p. u.	<u>Rs.16,096</u>	<u>Rs.16,096</u>	
Contribution p. u.	Rs.1,104	Rs.404	
No. of units	4	4	
Contribution (Rs.)	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	Rs.17,200	Rs.14,000
Variable Cost (excl. labour)	Rs.12,000	Rs.12,000
Labour cost:		
1280 × 4	Rs.5,120	

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1280 × 1		<u>Rs.1280</u>	
Total Variable Cost	<u>Rs.17,120</u>	<u>Rs.13,280</u>	
Contribution	Rs.80	Rs.720	
Units	4	4	
Contribution (Rs.)	320	2,880	3,200

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

Question 2

- (a) 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 Rs.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. (13 Marks)

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

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

Rs.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 Rs.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 Rs.5,000 per unit on shipping costs. In this market also, the selling price that each unit will fetch is Rs.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.
- (b) What are the various formulae used in calculating budget ratios? (3 Marks)

Answer

2. (a)

	Order Qty 100-140 (Rs.)	Order Qty 141-200 (Rs.)
Selling Price Rs./u	30,000	30,000

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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

- (i) Upto 110 units, Reference will earn a contribution of Rs.4,000/u.
- (ii) 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.
- (iii) 101 – 110 not to be considered since additional fixed costs 2,25,000 will not be covered by 10 units.
- (iv) Valid consideration, 100 units or 141 to 190 units.

Fixed cost of box of 50 cameras is Rs. 2,25,000

Units		100	141	150	190
No. of Camera Boxes	A	2	3	3	4
Cost of Cameras (Rs.)	B	4,50,000	6,75,000	6,75,000	9,00,000
Contribution (Rs/u) Rs. 4,000	C	400,000			
Contribution (Rs.) first 110 units @ 7,000/u	D		7,70,000	7,70,000	7,70,000
Contribution (Rs.) Balance units @ 2,000/u	E		62,000	80,000	1,60,000
Total Contribution (F = C + D + E) (Rs.)	F	4,00,000	8,32,000	8,50,000	9,30,000
Profit (F) – (B) (Rs.)	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 Rs./u = $\frac{50,000}{2,000} = 25$

∴ BEP = 150 + 25 = 175 units

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Alternative Solution to Q2(a)

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

	Units sold			
	110	140	150	190
Margin per unit = Sales price – buying price + commission (Rs)	4000	4000	7000	7000
Margin (Excluding shipping cost)	4,40,000	5,60,000	10,50,000	13,30,000
Shipping cost (Rs)		30 x 5000	40 x 5000	80 x 5000
For sale beyond 110 units		= 1,50,00	= 2,00,000	= 4,00,000
Contribution (Rs)	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 = Rs 9,00,000

We have, 7000 X = (X -110) x 5000 + 900000

Or 7X = 5X – 550 +900

Or 2X = 350 or X = 175

Thus, BEP = 175 units.

(b) Type of budgeted ratio used are:

1. Efficiency Ratio = (Standard hours + Actual hours) × 100
2. Activity Ratio = (Standard hours + Budgeted hours) × 100
3. Calendar Ratio = (Available working days ÷ budgeted working days) × 100
4. Standard Capacity Usage Ratio (Budgeted hours ÷ Max. possible hours in the budgeted period) × 100
5. Actual Capacity Usage Ratio = (Actual hours worked + Maximum possible working hours in a period) × 100
6. Actual usage of Budgeted Capacity Ratio = (Actual working hours ÷ Budgeted hours) × 100

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Question 3

- (a) The CEO of your company has been given the following statement showing the results for a recent month:

Particulars	Master Budget	Actual
Units produced & sold	10,000	9,000
	Rs.	Rs.
Sales	8,00,000	7,00,000
Direct material	2,00,000	1,84,000
Direct Wages	3,00,000	2,62,000
Variable overhead	1,00,000	94,000
Fixed overhead	1,00,000	98,000
Total Cost	7,00,000	6,38,000
Net Surplus	1,00,000	62,000

The standard cost of the product is as follows:

Direct material (1 kg @ Rs. 20/kg) Rs. 20.00 per unit

Direct Wages (1 hour @ Rs. 30/hour) Rs. 30.00 per unit

Variable overhead (1 hour @ Rs. 10/hour) Rs. 10.00 per unit

Actual results for the month revealed that 9,800 kg. of material was used and 8,800 labour hours were recorded.

- (i) Prepare a flexible budget for the month and compare with the actual results. (6 Marks)
- (ii) Calculate material volume and variable overhead efficiency variances. (2 Marks)
- (b) What is disinvestments strategy? Highlight the main reasons for disinvestments. (4 Marks)
- (c) What is uniform costing? Why is it recommended? (4 Marks)

Answer

3. (a) (i)

Particular	Master Budget		Flexible Budget	Actual	Variance
Units	10,000		9,000	9,000	
	(Rs.) Total	(Rs.) Per Unit	(Rs.)	(Rs.)	
Sales	8,00,000	80	7,20,000	7,00,000	20,000 (A)
Direct Material	2,00,000	20	1,80,000	1,84,000	4,000 (A)
Direct Wages	3,00,000	30	2,70,000	2,62,000	8,000 (F)

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Variable Overhead	1,00,000	10	90,000	94,000	4,000 (A)
Total Variable Cost	6,00,000	60	5,40,000	5,40,000	-
Contribution	2,00,000	20	1,80,000	1,60,000	20,000 (A)
Fixed Overhead	1,00,000	10	1,00,000	98,000	2,000 (F)
Net Profit	1,00,000	10	80,000	62,000	18,000 (A)

(ii) Calculation of Variances:

Material Volume Variance: $SP (SQ - AQ) = 20 (9,000 - 9,800) = 16,000 (A)$

Variable Overhead efficiency variance $SR (SH - AR) = 10 (9,000 - 8,800) = 2,000 (F)$

(b) Divestment Strategy:

Divestment involves a strategy of selling off or shedding business operations to divert the resources, so released, for other purposes. Selling off a business segment or product division is one of the frequent forms of divestment strategy. It may also include selling off or giving up the control over subsidiary where by the wholly owned subsidiaries may be floated as independently quoted companies.

Reason for Divestment Strategy

1. In case of a firm having an opportunity to get more profitable product or segment but have resource constraint, it may selling off it's unprofitable or less profitable division and utilized the resource so released. Cost Benefit analysis & Capital Budgeting Method are the useful tool for analyzing this type of situation.
2. In case of purchase of new business, it may be found that some of the part of the acquired business is not upto the mark. In such type of situation disposal of the unwanted part of the business is more desirable than hold it.
3. In case where any business segment or product or subsidiary is pull down the profit of the whole organization, it is better to cut down of that operation of the product or business segment.

(c) Uniform Costing: It is not a distinct method of costing when several undertakings start using the same costing principles or practices, they are said to be following uniform costing. Different concerns in an industry should adopt a common method of costing and apply uniformly the same principles and techniques for better cost comparison and common good and helps in mutual cost control and cost reduction. Hence, it is recommended that a uniform method of costing should be adopted by the member units of an industry.

Question 4

- (a) The cost per unit of transporting goods from the factories X, Y, Z to destinations. A, B and C, and the quantities demanded and supplied are tabulated below. As the company is working out the optimum logistics, the Govt.; has announced a fall in oil prices. The

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revised unit costs are exactly half the costs given in the table. You are required to evaluate the minimum transportation cost. (6 Marks)

Destinations Factories	A	B	C	Supply
X	15	9	6	10
Y	21	12	6	10
Z	6	18	9	10
Demand	10	10	10	30

- (b) Give an appropriate cost unit for each of the following service sectors: 4
- (i) Hotel
 - (ii) School
 - (iii) Hospital
 - (iv) Accounting firm
 - (v) Transport
 - (vi) Staff Canteen
 - (vii) Machine maintenance
 - (viii) Computer Department
- (c) A factory manager contends that the mean operating life of light bulbs of his factory is 4,200 hours. A customer disagrees and says it is less. (6 Marks)

The mean operating life for a random sample of 9 bulbs is 4,000 hours, with a sample standard deviation of 201 hours.

Test the hypothesis of the factory manager, given that the critical value of the test statistic as per the table is (-) 2.896.

Answer

- (a) The problem may be treated as an assignment problem. The solution will be the same even if prices are halved. Only at the last stage, calculate the minimum cost and divide it by 2 to account for fall in oil prices.

	A	B	C
X	15	9	6
Y	21	12	6
Z	6	18	9

Subtracting Row minimum, we get

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	A	B	C
X	9	3	0
Y	15	6	0
Z	0	12	3

Subtracting Column minimum,

	A	B	C
X	9	0	0
Y	15	3	0
Z	0	9	3

No of lines required to cut Zeros = 3

		Cost / u	Units	Cost	Revised Cost
Allocation:	X → B	9	10	90	45
	Y → C	6	10	60	30
	Z → A	6	10	<u>60</u>	<u>30</u>
				<u>210</u>	<u>105</u>

Minimum cost = 105 Rs.

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Alternative Solution I

Least Cost Method

	A	B Step V	C		Step I Diff.	Step III	
X	15	9 10	6	10	3	3	← Step IV
Y	21	12	6 10	10	6	6	
Z	6 10	18	9	10	3		
	10	10	10	30			
Step I Diff.	9	3	10				
Step III Diff.	Step II	3	10				

Initial Feasible solution

X – B

Y – C

Z – A

Test for optimality

No. of allocation = 3

No. of rows m = 3, no. of column = 3

$$m + n - 1 = 3 + 3 - 1 = 5$$

2 very small allocation are done to 2 cells of minimum costs, so that , the following table is got :

	A	B	C
X	15	10 9	e 6
Y	21	12	10 6
Z	10 6	18	e 9

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$$m + n - 1 = 5$$

Now testing for optimality

				U_i
		9	e	0
			6	0
	6		e	0
V_j	6	9	6	

$U_i + V_j$ for unoccupied cells

	A	B	C
X	6	-	-
Y	6	9	-
Z	-	9	-

Diff = $C_{ij} - (U_i + V_j)$

	A	B	C
X	9	-	-
Y	15	3	-
Z	-	9	-

All $\Delta_{ij} > 0$, Hence this is the optimal solution.

	Original Costs	Reduced Costs due to Oil Price	Qty.	Cost
X – B	9	4.5	10	45
Y – C	6	3	10	30
Z – A	6	3	10	<u>30</u>
				<u>105</u>

Total cost of transportation is minimum at Rs.105

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Alternative Solution II

	A	B	C		Step I Diff.	Step III Diff.
X	7.5	4.5	3	10	1.5	1.5
Y	11.5	6	3	10	3	3
Z	3	9	1.5	10	1.5	
Qty.	10	10	10	30		
Step I Diff.	4.5	1.5	0			
Step III Diff.	Step II	1.5	0			

Step V

Step IV

Initial Solution :

	A	B	C
X	7.5	4.5	3
Y	11.5	6	3
Z	3	9	4.5

No. of rows + no. of column – 1

$$m + n - 1 = 5$$

No. of allocation = 3

Hence add 'e' to 2 least cost cells so that

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X	7.5	4.5	10	e
Y	11.5	6	3	10
Z	3	10	9	4.5
				e

Now $m + n - 1 = 5$

Testing for optimality,

u_i, v_j table

	A	B	C	u_i
X		4.5	e	0
Y			3	0
Z	3		e	0
v_j	3	4.5	3	

$u_i + v_j$ for unoccupied cells

	3	-	-
	3	4.5	-
	-	4.5	-

C_{ij}			
7.5	-	-	
11.5	6	-	
-	9	-	

$\Delta_{ij} = C_{ij} - (u_i + v_j)$

4.5	-	-	
11.5	1.5	-	
8.5	4.5	-	

$u_i + v_j$			
3	-	-	
3	4.5	-	
-	4.5	-	

All $\Delta_{ij} > 0$. Hence the solution is optimal.

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	Qty.	Cost/u	Total Cost
X – B	10	4.5	45
Y – C	10	3	30
Z – A	10	3	30
Total minimum cost at revised oil prices			105

(b)

Service Sector		Cost Unit
(i)	Hotel	Bednights available or occupied
(ii)	School	Student hours or no. of full time students
(iii)	Hospital	Patient-day / Room-day
(iv)	Accounting firm	Client hours
(v)	Transport	Passenger-Kms, or Quintal km or tonne-km
(vi)	Staff Canteen	No. of meals provided or no. of staff
(vii)	Machine maintenance	Maintenance hours to user departments
(viii)	Computer Department	Computer time to user departments.

(c) Manager's Hypothesis	H_0	$\mu_0 = 4,200$
	H_1	$\mu < 4,200$ (Left Tail test)

$$t = \frac{\bar{x} - \mu_0}{\sigma}$$

$$\text{where } \sigma = \frac{s}{\sqrt{n}} = \frac{201}{\sqrt{9}} = \frac{201}{3} = 67$$

$$t = \frac{4,000 - 4,200}{67} = \frac{-200}{67} = -2.985$$

Calculated $t = 2.985$, < table value of $t .01$ (sdf) which is -2.896

Hence reject the null hypothesis H_0 . i.e. Accept H_1

The customer's claim is correct.

Question 5

- (a) Bearings Ltd. makes three products, A, B and C in Divisions A, Band C respectively. The following information is given: (12 Marks)

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	A	B	C	
Direct Materials (excluding material A for Divisions B and C)	4	15	20	Rs./u
Direct Labour	2	3	4	Rs./u
Variable overhead	1	1	1	Rs./u
Selling price to outside customers	15	40	50	Rs./u
Existing Capacity	5,000	2,500	2,500	(No. of units)
Maximum External demand	3,750	5,000	4,000	(No. of units)
Additional fixed costs that would be incurred to install additional capacity	24,000	6,000	18,700	Rs.
Maximum Additional units that can be produced by additional capacity	5,000	1,250	2,250	(No. of units)

B and C need material A as their input. Material A is available outside at Rs.15 per unit. Division A supplies the material free from defects. Each unit of B and C requires one unit of A as the input material.

If B purchases from outside, it has to pay Rs.15 per unit. If B purchases from A, it has to incur in addition to the transfer price, Rs.2 per unit as variable cost to modify it.

B has sufficient idle capacity to inspect its inputs without additional costs.

If C gets material from A, it can use it directly, but if it gets material from outside, which is at Rs.15, it has to do one of the following:

(i) Inspect it at its own shop floor at Rs.3 per unit

Or

(ii) Get the supplier to supply inspected products and pay the supplier Rs.2 p. u. as inspection charges.

Or

(iii) A has enough idle labour, which it can lend to C to inspect at Re. 1 p.u. even though C purchases from outside.

A has to fix a uniform transfer price for both B and C. The transfer price will not be known to outsiders and is at the discretion of the Divisional Managers.

What is the best strategy for each division and the company as a whole?

(b) Explain the following in the context of a network: (4 Marks)

(i) Critical path

(ii) Dummy activity.

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Answer

- (a) B will not pay A anything more than 13, because at 13, it will incur additional cost of Rs.2/- to modify it, $13 + 2 = 15$, the outside cost.

	A		B	C
	Outside sale	Transfer to B & C		
Divisional variable cost of production	7	7	19	25
Transfer from A			13	13
Modification			2	
Total Variable Cost of production	7	7	34	38
Selling Price	15	13	40	50
Contribution	8	6	6	12

Option for C, Purchase all units from A @ 13: Any other option is costlier.

	A	B	C
Maximum external demand	3,750	5,000	4,000
Existing capacity	5,000	2,500	2,500
Maximum capacity that can be added	5,000	1,250	2,250
Total maximum that can be produced	10,000	3,750	4,750
Additional fixed cost on expansion	24,000	6,000	18,700
Units that must be sold/transfer to get this amount as contribution	$\frac{24,000}{6} = 4,000$	$\frac{6,000}{6} = 1,000$	$\frac{18,700}{6} = 1,558.33$
External demand not covered by existing capacity	-	2,500	1,500
Decision	Expand make 10,000 units 3,750 – outside 3,750 – B 2,500 – C	Expand make 2,500 + 1,250 = 3,750 units	Do not expand make only 2,500 units.

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	A		B	C
	Outside sale	Transfer to B & C		
Units	3,750	3,750 + 2,500 = 6,250	3,750	2,500
Contribution / unit	8	6	6	12
Contribution (Rs.)	30,000	37,500	22,500	30,000
	67,500		22,500	30,000
Additional Fixed Cost	24,000		6,000	-
Net revenue addition	43,500		16,500	30,000

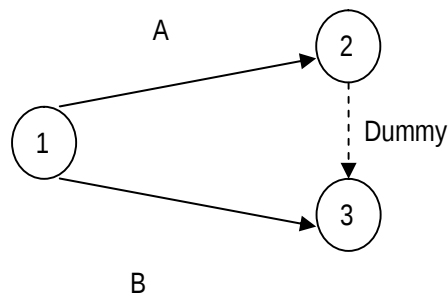
Individual strategy is the Company's best strategy.

(b) (i) Critical Path:

Critical Path is a chain of activities that begin with the starting event and ends with ending event of a particular project. It is that path that runs through a network with the maximum length of time or it indicates the maximum possible time required for completion of a project. Critical path indicates the minimum time that will be required to complete a project. It is determined after identifying critical events. Critical path goes through critical events.

(ii) Dummy Activities:

Dummy Activity is that activity which does not consume time or resources. It is used when two or more activities have same initial and terminal events. As a result of using dummy activities, other activities can be identified by unique end events. These are usually shown by arrows with dashed lines.



Question 6

(a) Formulate the dual for the following linear program:

(6 Marks)

Maximise : $100x_1 + 90x_2 + 40x_3 + 60x_4$

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Subject to

$$6x_1 + 4x_2 + 8x_3 + 4x_4 \leq 140$$

$$10x_1 + 10x_2 + 2x_3 + 6x_4 \leq 120$$

$$10x_1 + 12x_2 + 6x_3 + 2x_4 \leq 50$$

$$x_1, x_2, x_3, x_4, \geq 0$$

(Only formulation is required. Please do not solve.)

- (b) Name the various methods of fitting a straight line to a time series and briefly explain any two of them. (5 Marks)
- (c) Traditional Ltd. is a manufacturer of a range of goods. The cost structure of its different products is as follows: (5 Marks)

Particulars	Product A	Product B	Product C	
Direct materials	50	40	40	Rs./u
Direct labour @ 10 Rs./hour	30	40	50	Rs./u
Production overheads	30	40	50	Rs./u
Total Cost	110	120	140	Rs./u
Quantity produced	10,000	20,000	30,000	Units

Traditional Ltd. was absorbing overheads on the basis of direct labour hours. A newly appointed management accountant has suggested that the company should introduce ABC system and has identified cost drivers and cost pools as follows:

Activity Cost Pool	Cost Driver	Associated Cost
Stores Receiving	Purchase Requisitions	2,96,000
Inspection	Number of Production runs	8,94,000
Dispatch	Orders Executed	2,10,000
Machine Setup	Number of setups	12,00,000

The following information is also supplied:

Details	Product A	Product B	Product C
No. of Setups	360	390	450
No. of Orders Executed	180	270	300
No. of Production runs	750	1,050	1,200
No. of Purchase Requisitions	300	450	500

You are required to calculate activity based production cost of all the three products.

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Answer

(a) Dual:

$$\begin{array}{ll}\text{Minimise} & 140u_1 + 120u_2 + 50u_3 \\ \text{S.T.} & 6u_1 + 10u_2 + 10u_3 \geq 100 \\ & 4u_1 + 10u_2 + 12u_3 \geq 90 \\ & 8u_1 + 2u_2 + 6u_3 \geq 40 \\ & 4u_1 + 6u_2 + 2u_3 \geq 60 \\ & u_1, u_2, u_3, u_4 \geq 0\end{array}$$

(b) The various methods of fitting a straight line are:

- (i) Free hand method
- (ii) Semi-average
- (iii) Moving average
- (iv) Least square

Freehand method:

First the time series figures are plotted on a graph. The points are joined by straight lines. We get fluctuating straight lines, through which an average straight line is drawn. This method is however, inaccurate, since different persons may fit different trend lines for the same set of data.

Method of Semi Averages:

The given time series is divided into two parts, preferably with the same number of years. The average of each part is calculated and then a trend line through these averages is fitted.

Moving Average Method:

A regular periodic cycle is identified in the time series. The moving average of n years is got by dividing the moving total by n . The method is also used for seasonal and cyclical variation.

Method of Least Squares:

The equation of a straight line is $Y = A + bX$, where X is the time period, say year and Y is the value of the item measured against time, a is the Y intercept and b , the co-efficient of X , indicating the slope of the line. To find a and b , the following 'normal' equations are solved.

$$\sum Y = an + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

Where n is the no. of observation in the series or n = no. of data items.

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(c) The total production overheads are Rs.26,00,000:

Product A: 10,000 × Rs. 30 = Rs. 3,00,000

Product B: 20,000 × Rs. 40 = Rs. 8,00,000

Product C: 30,000 × Rs. 50 = Rs. 15,00,000

On the basis of ABC analysis this amount will be apportioned as follows:

Statement of Activity Based Production Cost							
Activity Pool	Cost	Cost Driver	Ratio	Total Amount (Rs.)	A (Rs.)	B (Rs.)	C
Stores Receiving		Purchase requisition	6:9:10	2,96,000	71,040	1,06,560	1,18,400
Inspection		Production Runs	5:7:8	8,94,000	2,23,500	3,12,900	3,57,600
Dispatch		Orders Executed	6:9:10	2,10,000	50,400	75,600	84,000
Machine Setups		Set ups	12:13:15	12,00,000	3,60,000	3,90,000	4,50,000
Total Activity Cost					7,04,940	8,85,060	10,10,000
Quantity Sold					10,000	20,000	30,000
Unit Cost					70.49	44.25	33.67
Add: Conversion Cost					80	80	90
Total					150.49	124.25	123.67

Question 7

(a) 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: (7 Marks)

Products	A	B	C	D
Contribution (Sales-direct material) Rs.	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.

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(b) Explain the essential features of Life-cycle costing. (5 Marks)

(c) Explain briefly the concepts of Opportunity costs and Relevant costs. (4 Marks)

Answer

(a)

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 (Rs.)	1500	1200	1000	600		
Time required in Machine 2	10	9	3	1.5		
Contribution per Machine – hour (Rs.)	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=11.11	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

(b) Essential features of Life Cycle Costing:

Product Life Cycle costing involves :

- Tracing of costs and revenue of product over several calendar period. Throughout their entire life cycle.
- Emphasis is on Cost and revenue accumulation over the entire life cycle of the product.
- Life cycle costing traces research and design.
- It focus on development costs, incurred to individual products over their entire life cycles.
- Total magnitude of research and development costs are reported and compared with product revenues generated in later periods.

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- (c) 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 – Rs.10/ hour

Direct labour under alternative II – Rs.20/hour

Then, direct labour is relevant cost.