

Hi Friends

You will be glad to know that like in past even in this attempt almost all questions of New course as well as old course was from my books & class tests.
A brief description for the same is:

New Course

- Question 1(a) - Simple question based on concept of Decision Making.
 Question 1(b) - **Exactly same** as Question 34 on Page 107 of Costing Book (2nd Edition).
 Question 1(c) - Theory question - See Page 62 of O.R. Book (2nd Edition).
 Question 2(a) - **Same** as Question 30 on Page 34 of Costing Book (2nd Edition).
 Question 2(b) - **Exactly same** as Question 55 on Page 217 of Costing Book (2nd Edition).
 Question 3(a) - **Exactly same** (figures changed) as Question 53 on Page 84 of Costing Book (2nd Edition).
 Question 3(b) - **Exactly same** as Question 41 on Page 200 of Costing Book (2nd Edition).
 Question 4(a) - **Exactly same** as Question 17 on Page 59 of O.R. Book (2nd Edition).
 Question 4(b) - Theory question - See Page 133 of Costing Book (2nd Edition).
 Question 5(a) - **Same** as Question 6 for 1st test for Sept batch & Question 4 of 1st test for Mar 10 Batch.
 Question 5(b) - **Exactly same** as Question 26 on Page 41 of O.R. Book (2nd Edition).
 Question 5(c) - Theory question - See Page 215 of O.R. Book (2nd Edition).
 Question 6(a) - Based on concepts of Target costing on Page 28-33.
 Question 6(b) - **Exactly same** as Question 2 on Page 18 of O.R. Book (2nd Edition).
 Question 6(c) - Theory question - See Page 188 of Costing Book (2nd Edition).

Old Course

- Question 1(a) - **Same** as Question 1 Pg. 15 of Additional notes on Marginal Costing (for Old Course).
 Question 1(b) - Based on Question 31 on Pg 43 of O.R. Book (2nd Edition).
 Question 2(a) - **Exactly same** (figures changed) as Question 77 on Page 172 of Costing Book (2nd Edition).
 Question 2(b) - Theory question - See Page 31 of Costing Book (2nd Edition).
 Question 2(c) - **Exactly same** as Question 33 on Page 39 of Costing Book (2nd Edition).
 Question 3(a) - Based on concepts dealt on Page 4 of O.R. Book (2nd Edition).
 Question 3(b) - Based on concepts dealt on Page 25 and similar to Question 4 on Page 26 of O.R. Book (2nd Edition).
 Question 3(c) - **Exactly same** as Question 28 on Page 195 of Costing Book (2nd Edition).
 Question 4(a) - **Same** as Question 36 on Page 129 of Costing Book (2nd Edition).
 Question 4(b) - Theory question - See Page 16 of O.R. Book (2nd Edition).
 Question 5(a) - Based on concepts of cost allocation base in Standard Costing on Page 57-59.
 Question 5(b) - **Exactly same** as Question 15 on Page 190 of Costing Book (2nd Edition).
 Question 5(c) - **Exactly same** as Question 8 on Page 48 of O.R. Book (1st Edition) & similar to Question 7 on Page 49 of O.R. Book (2nd Edition).

Solutions for New Course Question paper of Costing & O.R. for May'10 are attached herewith

May 2010 -New Course Question Paper

Answer all questions

Working notes should form part of the answer

Marks

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

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Costing & O.R.

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	Products		
	A	B	C
Sales (Units)	10,000	25,000	20,000
Selling Price p.u. (Rs.)	40	75	85
Direct Materials p.u. (Rs.)	10	14	18
Direct wages pu. @ Rs. 2 p.hr.	8	12	10
Variable overhead pu. (Rs.)	8	9	10
Fixed overhead (Rs.) p.u.	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:

	(Rs.)
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?

Ans.

Statement of Profitability of E Ltd. in Existing Situation				
	A	B	C	Total
No. of units	10,000	25,000	20,000	
	Rs.	Rs.	Rs.	
Selling Price per unit	40	75	85	
Less: Variable Cost per unit				
Direct Material	10	14	18	
Direct wages	8	12	10	
Variable Overhead	8	9	10	
Contribution per unit	14	40	47	
Total Contribution	1,40,000	10,00,000	9,40,000	20,80,000
Less: Fixed Cost	1,60,000	4,50,000	4,00,000	10,10,000
Net Profit	-20,000	5,50,000	5,40,000	10,70,000

Calculation of overall profit under each proposal

(ii)(a) If Product A is discontinued and capacity released is utilized for either B, either C or for both B and C

Revised contribution of Product B and Product C.

	B(Rs.)	C (Rs.)
Selling Price per unit	73.50	80.75
	(75 – 2% of 75)	(85 – 5% of 85)
Less: Variable cost per unit		

Direct Material	15.40 (14 + 10% of 14)	18.90 (18 + 5% of 18)
Direct Wages	12.00	10.00
Variable Overhead	9.00	10.00
Contribution per unit	37.10	41.85

	Profitability Statement			
	Option 1	Option 2	Option 3- Both B and C equally	
	Only B	Only C	B	C
No. of Units (as per W.N.1)	6,666	8,000	3,333	4,000
	Rs.	Rs.	Rs.	Rs.
Additional contribution	2,47,308.6	3,34,800	1,23,654.3	1,67,400
			2,91,054.3	
Savings from Fixed Cost of A	1,60,000	1,60,000	1,60,000	
Reduction in contribution from A	1,40,000	1,40,000	1,40,000	
Net Increase in Profit	267,308.6	3,54,800	3,11,054.3	
Existing Profit	10,70,000	10,70,000	10,70,000	
Total Profit	13,37,308.6	14,24,800	3,31,054.3	

Hence, it is better to produce Product C only.

(ii)(b) Discontinue Product A and divert the capacity to produce Product D

	A	B	C	Total
Sales (units)	10,000	25,000	20,000	
Labour Hrs. per unit	4	6	5	
Total Labour Hours	40,000	1,50,000	1,00,000	2,90,000
Idle Capacity (hours)	2,90,000 * 20 / 80			72,500
Capacity released of A				40,000
Total hours released				1,12,500
Hours per unit				4
No. of units that can be produced				28,125

Profitability Statement	
No. of units	28,125
	Rs.
Selling Price per unit	60
<u>Less:</u> Variable Cost per unit	
Direct Material	28
Direct wages	12
Variable Overhead	6
Contribution per unit	14
Additional Contribution (D)	3,93,750
<u>Less:</u> Additional Fixed Cost	1,05,500
Additional Net Profit	2,88,250
Add: Existing Profit (B & C)	10,90,000
Total Profit	13,78,250

(c) If we hire out the idle capacity

	Rs.
Idle hrs.	72,500
Profit per hour (10,70,000 / 2,90,000)	3.69
Total Profit	2,67,500
Existing Profit	10,70,000
Total Profit	13,37,500

Decision : Better to produce product C as per proposal (a)

Working Note-1: Hours release on discontinuation of Product A = 10,000 * 4

Only B Only C B and C equally

$$40,000 / 6 = 6,666 \quad 40,000 / 5 = 8,000 \quad \text{B- 3333 and C- 4000}$$

- (b) A Company is engaged in manufacturing two products A and B. Product A uses one unit of component X and two units of component Y. Product B uses two units of component X and one unit of component Y and two units of component Z. Component Z which is assembled in the factory uses one unit of component Y.

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Components X and Y are purchased from the market. The company has prepared the following forecast of sales and inventory for the next year:

	Product A (Units)	Product B (Units)
Sales	80,000	1,50,000
Stock at the end of the year	10,000	20,000
Stock at the beginning of the year	30,000	50,000

The production of both the products and the assembling of the component Z will be spread out uniformly throughout the year. The company at present orders its inventory of X and Y in quantities equivalent to 3 months production. The company has compiled the following data related to the two components:

	X	Y
Price per unit (Rs.)	20	8
Order placing cost per order (Rs.)	1,500	1,500
Carrying cost per annum	20%	20%

Required:

- Prepare a budget for production and requirements of components for the next year.
- Suggest the optimal order quantity of components X and Y.

Ans. (i) **Production Budget for product A and B**

	A units	B units
Inventory at the end of the year	10,000	20,000
Sales forecast	80,000	1,50,000
Total requirements	90,000	1,70,000
Less: Beginning inventory	30,000	50,000
Production	60,000	120,000

Budgeted requirements of components P, Q and R

Components	X	Y	Z
For Product A: Production 60,000 units			
P: 60,000 × 1 per unit	60,000		
Q: 60,000 × 2 per unit		1,20,000	
For Product B: Production 1,20,000 units			
P: 1,20,000 × 2 per unit	2,40,000		
Q: 1,20,000 × 1 per unit		1,20,000	
R: 1,20,000 × 2 per unit			2,40,000
For comp R: Production 2,40,000 comp			
Q: 24,000 × 1 per component R		2,40,000	
Total requirements	3,00,000	4,80,000	2,40,000

- (ii) **The company is advised to adopt EOQ system.**

$$\text{EOQ} \begin{matrix} \text{P} & \text{Q} \\ \sqrt{\frac{2 \times 3,00,000 \times 1,500}{20 \times 20\%}} & \sqrt{\frac{2 \times 4,80,000 \times 1,500}{8 \times 20\%}} \end{matrix}$$

= 15,000 components

= 30,000 components

- (c) Identify the characteristics movement such as regular, irregular, cyclical, seasonal, long-term trend, short-term etc. of time series in the following situations: 3
- (i) A factory delaying its production due to demolition of factory shed in earthquake.
 - (ii) An era of Depression in business.
 - (iii) The country needs more and more food grains due to constant growth of population.
 - (iv) Decline in death rate due to availability of proper health care facilities.
 - (v) A continuous increase in demand of small cars.
 - (vi) A demand of gold products is increasing during the festival time.

Ans. (i) Irregular (ii) Cyclical (iii) Long term trend (iv) Long term trend (v) Long term trend (vi) Seasonal

2 AML Ltd. Is engaged in production of three types of ice-cream products: 12

- (a) Coco, Strawberry and Vanilla. The company presently sells 50,000 units of coco @ Rs.25 per unit, Strawberry 20,000 @ Rs. 20 per unit and Vanilla 60,000 units @ 15 per unit. The demand is sensitive to selling price and it has been observed that every reduction of Rs. 1 per unit in selling price, increases the demand for each product by 10% to the previous level. The company has the production capacity of 60,500 units of coco, 24,200 units of strawberry and 72,600 units of vanilla. The company marks up 25% of the cost of product.

The company management decides to apply ABC analysis. For this purpose it identifies four activities and the rates as follows:

Activity	Cost rate
Ordering	Rs. 800 per purchase order
Delivery	Rs. 700 per delivery
Shelf stocking	Rs.199 per hour
Customer Support and assistance	Rs.1.10 p.u. sold.

The other relevant information for the products are as follows:

	Coco	Strawberry	Vanilla
Direct Materials p.u. (Rs.)	8	6	5
Direct wages p.u. (Rs.)	5	4	3
No. of purchase order	35	30	15
No. of deliveries	112	66	48
Shelf stocking hours	130	150	160

Under the traditional costing system, store support costs are charged @ 30% of prime cost. In ABC these costs are coming under customer support and assistance.

Required

- (i) Calculate target cost for each product after a reduction of selling price required to achieve the sales equal to the production capacity.
- (ii) Calculate the total cost and unit cost of each product at the maximum level using traditional costing.
- (iii) Calculate the total cost and unit cost of each product. at the maximum level using activity based costing.
- (iv) Compare the cost of each product calculated in (i) and (ii) with (iii) and comment on it.

Ans. (i) Cost of product as per Target Costing

	Coco	Strawberry	Vanilla
Selling Price per unit	23.00	18.00	13.00
Less: Markup (25% of cost or 20% of selling Price)	4.60	3.60	2.60
Target Cost per unit (Rs.)	18.40	14.40	10.40

(ii) Cost of product as per Traditional Costing

	Coco	Strawberry	Vanilla
Maximum Volume (units)	60,500	24,200	72,600
	Rs.	Rs.	Rs.
Material	8.00	6.00	5.00
Labour	5.00	4.00	3.00
Prime Cost	13.00	10.00	8.00
Store Support (30% of Prime Cost)	3.90	3.00	2.40
Total Cost per unit	16.90	13.00	10.40

Total Cost	10,22,450	3,14,600	7,55,040
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(iii) Cost of product as per Activity Based Costing

	Coco	Stawberry	Vanilla
Maximum Volume (units)	60,500	24,200	72,600
	Rs.	Rs.	Rs.
Material	8.00	6.00	5.00
Labour	5.00	4.00	3.00
Prime Cost	13.00	10.00	8.00
Overheads (Working Note-2)	3.29	5.23	2.17
Total Cost per unit	16.29	15.23	10.17
Total Cost	9,85,320	3,68,670	7,38,100

(iv) Comparision in Cost of each product under each method

	Coco	Stawberry	Vanilla
As per Target Costing	18.40	14.40	10.40
As per Traditional Costing	16.90	13.00	10.40
As per Activity based Costing	16.29	15.23	10.17

Comment: Since cost of Strawberry is high in ABC costing in comparison to target costing and traditional methods, it is indicating that actual profit under target costing is less than targeted.

Working Note-1 :

	Coco	Stawberry	Vanilla
Current Selling Price per unit (Rs.)	25.00	20.00	15.00
Current Sales (units)	50,000	20,000	60,000
Selling Price (Rs.)	24.00	19.00	14.00
Revised Sales (units)	55,000	22,000	66,000
Selling Price (Rs.)	23.00	18.00	13.00
Revised Sales (units) (upto production capacity)	60,500	24,200	72,600

Working Note-2 :

	Coco	Stawberry	Vanilla
Ordering Cost (35/30/15 @ 800)	28,000	24,000	12,000
Delivery Cost (112/66/48 @ 700)	78,400	46,200	33,600
Shelf Stocking (130/150/160 @ 199)	25,870	29,850	31,840
Customer Support (60,500/24,200/72,600 @ 1.1)	66,550	26,620	79,860
TOTAL COST	1,98,820	1,26,670	1,57,300
No. of units	60,500	24,200	72,600
Cost per unit	3.29	5.23	2.17

Note: On calculation of total overhead costs under traditional & ABC system, costs are same i.e. Rs. 4,82,790, hence we will ignore the line "In ABC these costs are coming under customer support and assistance." written in question.

(b) What are the essential requisites for the installation of Uniform costing system? 4

Ans. Essential requisites for the installation of uniform costing are as under:

- The firm's in the industry should be willing to share / furnish relevant data or information.
- A spirit of cooperation and mutual trust should prevail among the participating firms.
- Mutual exchange of ideas, methods used, special achievement made, research and know how etc. should be frequent.
- Bigger firms should take the lead towards sharing their experience and know how with the smaller firm to enable the latter to improve their performance.
- In case of accounting methods, principles, procedure and production method uniformity must be established.

3(a) X Ltd. produces and sells a single product. Standard cost card per unit of the product is as follows: 12

Direct Material	A 10Kg @ Rs.5 per Kg.	(Rs.) 50.00
	B 5 Kg @ Rs. 6 per Kg.	30.00
Direct wages 5 hours @ Rs. 5 per hour		25.00
Variable production Overhead 5 hours @ 12 per hour		60.00
Fixed production Overheads		25.00
Total Standard cost		190.00
Standard gross profit		35.00
Standard selling price		225.00

A fixed production overhead has been absorbed on the expected annual output of 25,200 units produced evenly throughout the year. During the month of December, 2009 the following were the actual results for an actual production of 2,000 units: -

Sales 2,000 units @ Rs. 225		(Rs.) 4,50,000
Direct Material	A 18,900 kg.	99,225
	B 10,750 kg.	61,275
Direct Wages 10,500 hrs (actually worked 10,300 hours)		50,400
Variable Production overhead		1,15,000
Fixed production overhead		56,600
Total		3,82,500
Gross Profit		67,500

The material price variance is extracted at the time of receipt of materials.

Material purchase were A 20,000 kg. @ Rs. 5.25 per kg; B 11,500 kg @ Rs. 5.70 per kg. Required:

- Calculate all variances.
- Prepare an operating statement showing Standard gross profit, Variances and Actual gross profit.
- Explain the reason for the difference in actual gross profit given in the question and calculated in (ii) above.

Ans. (i) Computation of Variances

Material variances

Material (1)	Std. Qty. for actual output Kg. (2)	Std. Price per kg Rs. (3)	Qty. Purchase Kg. (4)	Qty. Consumed Kg. (5)	Actual Price per Kg Rs.(6)	Revised Std. Qty. Kg. (7)
A	20,000	5.00	20,000	18,900	5.25	19,767
B	10,000	6.00	11,500	10,750	5.70	9,883

Material Price Variance = (Std. price per kg – Actual price per kg) × Actual Qty Purchased

$$= [(3) - (6)] \times (4)$$

$$\begin{aligned} \text{A:} &= (5 - 5.25) \times 20,000 = 5,000 \text{ (A)} \\ \text{B:} &= (6 - 5.70) \times 11,500 = 3,450 \text{ (F)} \\ &= \mathbf{1,550 \text{ (A)}} \end{aligned}$$

Material Mix Variance = (Revised Std. qty - Actual qty consumed) × Std. price per kg

$$= [(7) - (5)] \times (3)$$

$$\begin{aligned} \text{A:} &= (19,767 - 18,900) \times 5 = 4,335 \text{ (F)} \\ \text{B:} &= (9,883 - 10,750) \times 6 = 5,202 \text{ (A)} \\ &= \mathbf{867 \text{ (A)}} \end{aligned}$$

Material Yield Variance = (Actual Output – Std. Output for qty consumed) × Std. price per unit

$$= \left(2000 - 29650 \times \frac{1}{15} \right) \times 80$$

$$= 1,867 \text{ (F)}$$

Labour variances

Std. Hours for actual output (1)	Std. Rate Rs. (2)	Actual Hours paid (3)	Actual Hours worked (4)	Actual Rate Rs. (5)
10,000	5	10,500	10,300	4.8

Labour Cost Variance = Std. cost for actual output – Actual cost paid

$$= 10,000 \times 5 - 50,400$$

$$\begin{aligned}
 &= 400 \text{ (A)} \\
 \text{Labour Rate Variance} &= (\text{Std. rate per hr} - \text{Actual rate per hr}) \times \text{Actual Hours paid} \\
 &= (5 - 4.8) \times 10,500 \\
 &= 2,100 \text{ (F)} \\
 \text{Labour Efficiency Variance} &= (\text{Std. hours for actual output} - \text{Actual hours worked}) \times \text{Std. rate} \\
 &= (10,000 - 10,300) \times 5 \\
 &= 1,500 \text{ (A)} \\
 \text{Labour Idle Time Variance} &= (\text{Actual hours worked} - \text{Actual hours paid}) \times \text{Std. rate} \\
 &= (10,300 - 10,500) \times 5 \\
 &= 1,000 \text{ (A)}
 \end{aligned}$$

Variable Overhead variances

Std. Hours for actual output (1)	Std. Rate Rs. (2)	Actual Hours worked (4)	Actual cost Rs. (5)
10,000	12	10,300	1,15,000

$$\begin{aligned}
 \text{Variable Overhead Cost Variance} &= \text{Std. cost for actual output} - \text{Actual cost paid} \\
 &= 10,000 \times 12 - 1,15,000 \\
 &= 5,000 \text{ (F)} \\
 \text{Variable Overhead Rate Variance} &= (\text{Std. rate p.h} - \text{Actual rate p.h.}) \times \text{Actual Hours worked} \\
 &= 12 \times 10,300 - 1,15,000 \\
 &= 8,600 \text{ (F)} \\
 \text{Variable Overhead Efficiency Variance} &= (\text{Std. hours for actual output} - \text{Actual hours worked}) \times \text{Std. rate} \\
 &= (10,000 - 10,300) \times 12 \\
 &= 3,600 \text{ (A)}
 \end{aligned}$$

Fixed Overhead variances

Basic calculations

$$\begin{aligned}
 \text{(a) Budgeted overheads for December} &= \frac{25,200 \times 25}{12} = \text{Rs.} 52,500 \\
 \text{(b) Fixed production overheads per hour} &= 25/5 = 5 \\
 \text{(c) Recovered overhead} &= 10,000 \text{ hours} \times 5 = \text{Rs.} 50,000 \\
 \text{(d) Actual overheads} &= \text{Rs.} 56,600
 \end{aligned}$$

Variances

Fixed Overhead Cost variance

$$\begin{aligned}
 &= \text{Recovered Overheads} - \text{Actual Overheads} \\
 &= 50,000 - 56,600 = \text{Rs.} 6,600 \text{ (A)}
 \end{aligned}$$

Fixed Overhead Expenditure Variance

$$\begin{aligned}
 &= \text{Budgeted Overheads} - \text{Actual overheads} \\
 &= 52,500 - 56,600 = \text{Rs.} 4,100 \text{ (A)}
 \end{aligned}$$

Fixed Overhead Capacity Variance

$$\begin{aligned}
 &= (\text{Std. Overhead rate per hour}) \times (\text{Actual hours worked} - \text{Budgeted hours}) \\
 &= 5 \times (10,300 - 10,500) = \text{Rs.} 1,000 \text{ (A)}
 \end{aligned}$$

Fixed Overhead Efficiency variance

$$\begin{aligned}
 &= (\text{Std. rate per hour}) \times (\text{Std. hrs. produced} - \text{Actual hours worked}) \\
 &= 5 \times (10,000 - 10,300) = \text{Rs.} 1,500 \text{ (A)}
 \end{aligned}$$

Sales Margin Variances

Total Sales Margin Variance = Budgeted Sales Margin – Actual Sales Margin

$$\begin{aligned}
 &= 25,200/12 \times 35 - 2000 \times (225-190) \\
 &= 3,500 \text{ (A)}
 \end{aligned}$$

Sales Margin Price Variance = (Std. margin p.u. – Actual margin p.u.) × Actual Volume

$$\begin{aligned}
 &= [35 - (225-190)] \times 2,000 \\
 &= \text{Nil}
 \end{aligned}$$

Sales Margin Volume Variance = (Budgeted Volume – Actual Volume) × Std. margin p.u.

$$= (25,200/12 - 2000) \times 35$$

= 3,500 (A)

**(ii) Operating Statement
(Rs.)**

(a)	Sales	(2,000 × Rs.225)	4,50,000	
	Less: Std. Cost of Sales	(2,000 × Rs.190)	3,80,000	
	Standard profit			70,000
(b)	Variances	Favourable	Adverse	
	Materials			
	Price	-	1,550	
	Yield	1,867	-	
	Mix	-	867	
	Direct Labour			
	Rate	2,100	-	
	Efficiency	-	1,500	
	Idle Time	-	1,000	
	Variable Overheads			
	Rate	8,600	-	
	Efficiency	-	3,600	
	Fixed Overheads			
	Expenditure	-	4,100	
	Capacity	-	1,000	
	Efficiency	-	1,500	
		<u>12,567</u>	<u>15,117</u>	<u>2,550 (A)</u>
(c)	Actual Profit			67,450

(iii) In the solution given the price variance has been calculated at the point of purchase. In case it is calculated at the point of issue the variance will be as follows:

		(Rs.)
A	(5-5.25) × 18,900	4,725 (A)
B	(6-5.70) × 10,750	3,225 (F)
		<u>1,500 (A)</u>
	Present variance	1,550 (A)
	Hence difference	<u>50</u>
	Actual profit as in (ii) above	67,450
	Price variance difference	<u>50</u>
	Actual profit as per question	67,500

(b) What is Backflushing in JIT? State the problems that must be addressed for the effective functioning of the system. 4

Ans. Backflushing requires no data entry of any kind until a finished product is completed. At that time the total amount finished is entered into the computer system, which multiples it by all the components listed in the bill of materials for each item produced. This yields a lengthy list of components that should have been used in the production process and which is subtracted from the beginning inventory balance to arrive at the amount of inventory that should now be left of hand. Back the entire production process. Given the large transaction volumes associated with JIT, this is an ideal solution to the problem.

The following problems must be corrected before it will work properly:

- (i) Production reporting
- (ii) Scrap reporting
- (iii) Lot tracing
- (iv) Inventory accuracy.

4(a) An electronics firm which has developed a new type of fire-alarm system has been asked to quote for a prospective contract. The customer requires separate price quotations for each of the following possible orders: 11

Order	Number of fire-alarm systems
First	100
Second	60
Third	40

The firm estimates the following cost per unit for the first order:

Direct materials	Rs. 500
Direct labour	
Deptt. A (Highly automatic) 20 hours at Rs. 10 per hour	
Deptt. B (Skilled labour) 40 hours at Rs. 15 per hour	
Variable overheads	20% of direct labour
Fixed overheads absorbed:	
Deptt. A	Rs. 8 per hour
Deptt. B	Rs. 5 per hour

Determine a price per unit for each of the three orders, assuming the firm uses a mark up of 25% on total costs and allows for an 80% learning curve. Extract from 80% Learning curve table:

X	1.0	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Y%	100.0	91.7	89.5	87.6	86.1	84.4	83.0	81.5	80.0

X represents the cumulative total volume produced to date expressed as a multiple of the initial order. Y is the learning curve factor, for a given X value, expressed as a percentage of the cost of the initial order.

Ans. (i) **Price per unit for first order of 100 units**

	Rs	Rs
Direct material		500.00
Direct labour	Dept A 20 Hrs @ 10 = 200	800.00
	Dept B 40 Hrs @ 15 = 600	
Variable Overhead	20% of Rs 800	160.00
Fixed Overhead	Dept A 20 Hrs @ 8 = 160	360.00
	Dept B 40 Hrs @ 5 = 200	
Total cost		1,820.00
Profit 25%		455.00
Selling price per unit		2,275.00

(ii) **Price per unit for second order of 60 units**

Learning will be applicable only in department B.

Cumulative output becomes 100 units + 60 units = 160 units i.e 1.6 times for which learning is 86.1 % from the tables.

Therefore Total Hrs for 160 units = 160 units × 40 × .861 = 5,510.4 Hrs

Therefore Hrs for 60 units = Hrs for 160 units less Hrs for 100 units

Or 5510.4 less 40 × 100 = 1510.4 Hrs

Therefore Hrs per unit = $\frac{1510.4}{60} = 25.17$

Calculation of selling price per unit

Rs

Direct materials		500.00
Direct labour	Dept A 20 Hrs @ 10 = 200	577.55
	Dept B 25.17 Hrs @ 15 =	
	377.55	
Variable Overhead	20% of 577.55	115.51
Fixed Overhead	Dept A 20 Hrs @8= 160	285.85
	Dept B 25.17 Hrs @5=125.85	
Total cost		1,478.91
Profit 25%		369.73
Selling price per unit		1,848.64

(iii) Price per unit for third order of 40 units

Cumulative output becomes 100 + 60 + 40 = 200 units i.e. 2 times for which learning is 80% from the table

Total Hrs for 200 units = $200 \times 40 \times .80 = 6,400$ Hrs

Hrs for 40 units = Hrs for 200 units less Hrs for 160 units

Or 6,400 less 5510.4 = 889.6 Hrs

Therefore Hrs per unit = $\frac{889.6}{40} = 22.24$

Calculation of selling price per unit

		Rs
Direct materials		500.00
Direct labour	Dept A 20 Hrs @ 10 = 200.00	533.60
	Dept B 22.24 @ 15 = 333.60	
Variable Overhead	20% of 533.60	106.72
Fixed Overhead	Dept A 20 Hrs @ 8 = 160	271.20
	Dept B 22.24 Hrs @ 5 = 111.20	
Total cost		1,411.52
Profit 25%		352.88
Selling price per unit		1,764.40

(b) What are the applications of incremental/ differential costs? 5

Ans. The areas in which Application of Incremental/ differential cost techniques of cost analysis can be used for making managerial decisions are:

- Make or buy decisions.
- Dropping or adding a product line
- Whether to process a product further or not.
- Acceptance of an additional order from a special customer at lower than existing price.
- Equipment replacement decision.
- Optimizing investment plan.

5(a) ABC Cooperative Bank receives and disburses different amount of cash in each month. The bank has an opening cash Balance of Rs. 15 crores in the first month. Pattern of receipts and disbursements from past data is as follows: 7

Monthly Cash receipts		Monthly Cash disbursements	
Rs. In Crores	Probability	Rs. In Crores	Probability
30	0.20	33	0.15
42	0.40	60	0.20
36	0.25	39	0.40
99	0.15	57	0.25

Simulate the cash position over a period of 12 months.

Required:

- (i) Calculate probability that the ABC Cooperative Bank will fall short in payments.
(ii) Calculate average monthly shortfall.
(iii) If ABC Bank can get an overdraft facility of Rs. 45 crores from other Nationalized banks.
What is the probability that they will fall short in monthly payments?
Use the following sequence (rowwise) of paired random numbers.

Ans. 1778 4316 7435 3123 7244 4692 5158 6808 9358 5478 9654 0977

Random No. Coding Table - Receipts

Amount (Rs. In crores)	Probability	Cum. Probability	Random No. Interval
30	0.20	0.20	00-19
42	0.40	0.60	20-59
36	0.25	0.85	60-84
99	0.15	1.00	85-99

Random No. Coding Table - Payments

Amount (Rs. In crores)	Probability	Cum. Probability	Random No. Interval
33	0.15	0.15	00-14
60	0.20	0.35	15-34
39	0.40	0.75	35-74
57	0.25	1.00	75-99

Simulation Table

Week	Op.Balance	Receipts		Payments		Cl.Balance
		Random No.	Amount (in crores)	Random No.	Amount (in crores)	
1	15	17	30	78	57	-12
2	-12	43	42	16	60	-30
3	-30	74	36	35	39	-33
4	-33	31	42	23	60	-51
5	-51	72	36	44	39	-54
6	-54	46	42	92	57	-69
7	-69	51	42	58	39	-66
8	-66	68	36	8	33	-63
9	-63	93	99	58	39	-3
10	-3	54	42	78	57	-18
11	-18	96	99	54	39	42
12	42	9	30	77	57	15

(i) Probability is $= 10 \div 12 = 0.83$

(ii) Total Shortfall is Rs. 399 crores. Therefore average shortfall is $399 \div 12 = \text{Rs. } 33.25$ crores
Alternatively, average shortfall is $399 \div 10 = \text{Rs. } 39.90$ crores

(iii) There will be a shortfall in 5 months i.e. 4,5,6,7,8. therefore the probability is $5 \div 12 = 0.42$

- (b) A small project is composed of seven activities, whose time estimates are listed below. Activities are identified by their beginning (i) and ending (j) note numbers : 4

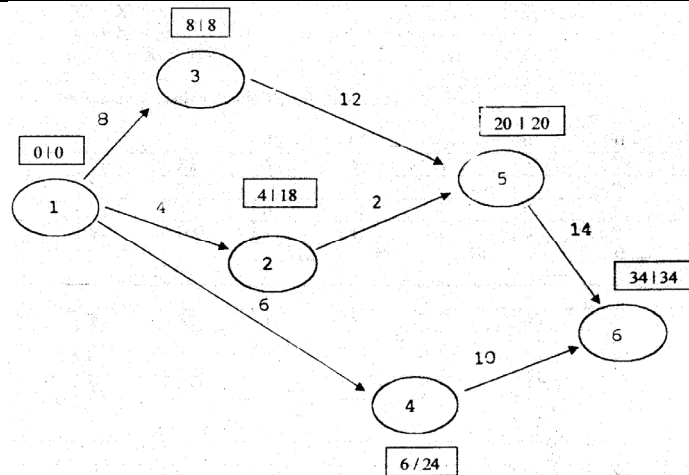
Activities (i-j)	Estimated duration (in days)		
	Optimistic	Most likely	Pessimistic
1-2	2	2	14
1-3	2	8	14
1-4	4	4	16
2-5	2	2	2
3-5	4	10	28
4-6	4	10	16
5-6	6	12	30

- (a) Draw the project network.
(b) Find the expected duration and variance for each activity. What is the expected project length ?

Given: Z	0.50	0.67	1.00	1.33	2.00
P	0.3085	0.2514	0.1587	0.0918	0.0228

Ans. The earliest and latest expected time for each event is calculated by considering the expected time of each activity as shown in the table below:

Activity (i - j)	t_0	t_m	t_p	$t_e = (t_0 + 4t_m + t_p) / 6$	$\sigma^2 = \left(\frac{t_p - t_0}{6} \right)^2$
1-2	2	2	14	4	4
1-3	2	8	14	8	4
1-4	4	4	16	6	4
2-5	2	2	2	2	0
3-5	4	10	28	12	16
4-6	4	10	16	10	4
5-6	6	12	30	14	16



The critical path is 1-----3----5----6

(b) The expected duration of the project $8+12+14 = 34$ days

(c) Brief the principles associated with synchronous manufacturing.

5

Ans. A set of seven 'principles' are associated with synchronous manufacturing:

1. Do not focus on balance idle capacities; focus on synchronizing the production flow.
2. The marginal value of time at a bottleneck resource is equal to the throughput rate of the products processed by the bottleneck.
3. The marginal value of time at a non-bottleneck resource is negligible.
4. The level of utilization of a non-bottleneck resource is controlled by other constraints within the system.
5. Resources must be utilized, not simply activated.
6. A transfer batch may not, and many times should not, be equal to the process batch.
7. A process batch should be variable both along its route and over time.

6(a) 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:

8

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 (Rs.)	145	115
Total hours available : Machine A	4,000 hours	

Machine B 4,500 hours
 Alloy available is 13,000 kgs. @ Rs. 12.50 per kg.
 Variable overheads per machine hours :
 Machine A : Rs. 80
 Machine B : Rs. 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 Rs. 60 per hour of unutilised machine hour, what will be the total contribution from the spare part identified above?

Ans.	Part A	Part B
Target Price (Rs.)	145	115
Less : Variable Cost p.u. (Rs.)		
Material (1.6 kg. @ Rs. 12.5 p.kg.) (Rs.)	20	20
Variable OH Machine A (0.6/0.25 hrs @ Rs. 80 p.h.) (Rs.)	48	20
Variable OH: Machine B (0.5/0.55 hrs @ Rs. 100 p.h.) (Rs.)	50	55
Total Variable Cost p.u. (Rs.)	118	95
Contribution p.u. (Rs.)	27	20
Number of parts can be manufactured on the basis of:		
Alloy Available (13000kg ÷ 1.6/1.6)	8,125	8,125
Machine A (4000 hrs ÷ 0.6/0.25)	6,666	16,000
Machine B (4500 hrs ÷ 0.5/0.55)	9,000	8,181
Maximum units that can be manufactured	6,666	8,125
Total Contribution (6,666 units × 27; 8,125 × 20)	179,982	162,500
Hence it is recommended to produce Part A.		

(b) Parts A to be Manufactured 6,666 units
 Hours utilized Idle hours
 Machine A usage (6,666 × 0.6) 3,999.6 0.4
 Machine B usage 3,333 1167
 Compensation for unutilized machine hour (1167.4 @ Rs 60/ hour) Rs. 70,044
 Revised contribution after reduction of 10% in S.P. [6,666 × (145 × 0.9 – 118)] Rs. 83,325
Total Contribution Rs. 153,369

(b) What do you mean by Degeneracy in transportation problem? How this can be solved? 4

Ans. If a basic feasible solution of transportation problem with m origins and n destinations has fewer than $m + n - 1$ positive x_{ij} (occupied cells) the problem is said to be a degenerate transportation problem. In case degeneracy occurs (i.e. allocations are less than $m+n-1$), infinitely small allocation(s) i.e. ϵ is/are introduced in least cost & independent cell to non-degenerate the solution. If least cost cell(s) is/are not independent, then cell(s) with next lower cost(s) is/are chosen.

Degeneracy can occur at initial basic feasible solution or at a later stage. It may be removed once the purpose is over.

(c) What is Price Discrimination ? Under what circumstances it is possible ? 4

Ans. Price discrimination is charging different prices with respect to customers, products, places and time. Price discrimination is possible if the following conditions are satisfied:
 (a) the maker must be capable of being segmented for price discrimination;
 (b) the customers should not be able to resell the product of the segment paying higher price; and
 (c) the chance of competitors' underselling in the segment of higher prices should not be possible.