Gurukripa's Guideline Answers to Nov 2013 Exam Questions
CA Final ADVANCED MANAGEMENT ACCOUNTING

Question No.1 is compulsory **(4 X 5 = 20 Marks).**

Answer **any five** questions from the **remaining six** questions **(16 X 5 = 80 Marks).** [Answer any 4 out of 5 in Q.7]

- Working Notes form part of the Answer. No Statistical or other Table will be distributed along with this Question Paper.
- In theory questions where situations are given, Candidates are not expected to copy the situations into the answer books.

Question 1(a): Relevant Costing – Minimum Price for an Order (5 Marks)

A Company has to decide whether to accept a Special Order or not for a certain Product M in respect of which the following information is given:

Material A required	5,000 Kg	Available in stock. It was purchased 5 years ago at ₹ 35 per Kg. If not used for M, it can be sold as scrap @ ₹ 15 per Kg.
Material B required	8,000 Kg	This has to be purchased at ₹ 25 per Kg from the market.
Other Hardware Items	₹ 10,000	To be incurred
Dept X– Labour Oriented	5 Men for 1 month @ ₹ 7,000 per month per Man	Labour to be freshly hired. No spare capacity available.
Dept Y– Machine Oriented	3,000 Machine Hours @ ₹ 5 per Machine Hour	Existing spare capacity may be used.
Pattern and Specification	₹ 15,000	To be incurred for M, but after the Order, it can be sold for ₹ 2,000

Considering Relevant Costs, find out the Minimum Value above which the Company may accept the Order.

Solution:

Particulars	Computation	₹
Material A	Already available – Rarely used – can be Scrapped – NRV (i.e. Scrap Value) lost is relevant as Opportunity Cost (5,000 Kg × ₹ 15)	75,000
Material B	To be purchased. Hence, Out–of–Pocket Cost is relevant. (8,000 Kg × ₹ 25)	2,00,000
Other Hardware Items	To be purchased. Hence, Out–of–Pocket Cost is relevant.	10,000
Department X	To be hired. Hence, Out–of–Pocket Cost is relevant. (5 Men × 1 month × ₹ 7,000)	35,000
Department Y	Spare Capacity to be used. Hence, ₹ 5 per hour is irrelevant. (**Note:** ₹ 5 ph is assumed as Absorption Rate irrespective of actual usage.)	Nil
Pattern & Specification	Net Effective Cost to be incurred is relevant, i.e. ₹ 15,000 – ₹ 2,000	13,000
Minimum Price = Total Relevant Cost as above		**3,33,000**

Question 1(b): Assignment – Optimum Solution Interpretations (5 Marks)

Answer the following independent situations relating to an Assignment Problem with a Minimization Objective:

(i) Just after Row and Column Minimum Operations, we find that a particular row has 2 zeroes. Does this imply that the 2 corresponding numbers in the Original Matrix before any operation were equal? Why?

(ii) Under the usual notation, where a_{32} means the element at the intersection of the 3rd Row and 2nd Column, we have, in a 4×4 Assignment Problem, a_{24} and a_{32} figuring in the Optimal Solution. What can you conclude about the remaining Assignments? Why?

Solution: **Case (i)**

- It is **not necessary** that the two corresponding numbers in the original matrix, before any operation should be equal.
- Any one of the two zeroes in that Row may have been derived out of Column minimum operations also.

- **Example:**

1. Original Matrix			2. Row Operations			3. Column Operations		
7	6	4	3	2	0	3	1	0
8	9	11	0	1	3	0	0	3
4	6	8	0	2	4	0	1	4

Note: R_{21} & R_{22} are zero after Row and Column Minimum Operations, but the numbers in the original matrix are '8' and '9' respectively.

Case (ii)

The given information is	Inference:
a a a a a a a [0] a [0] a a a a a a Where 'a' represents numbers ≥ 0, and all 'a' are not equal.	• The remaining assignments shall be – (i) a_{11} and a_{43} (or) (ii) a_{13} and a_{41}. • In these elements, the value of 'a' will be zero. • This is due to the one–for–one assignment, i.e. (i) two jobs cannot be assigned to the same person, (ii) two persons cannot be assigned the same job.

Question 1(c): Budgetary Control – Segregation of SV Overheads (5 Marks)

The PLN Co. presents the following Static Budgets for 4,000 units and 6,000 units Activity Levels for October 2013:

Particulars	4,000 units Activity Level	6,000 units Activity Level
Overhead A ₹ 12 per hr x 2 hr per unit	₹ 96,000	₹ 1,44,000
Overhead B	₹ 1,40,000	₹ 1,90,000

Overhead C was omitted to be listed out. It is a Fixed Plant Overhead, estimated at ₹ 12.5 per hr at 4,000 units Activity Level. This has to also feature in the Flexible Budget. The Actual Production was 5,000 units and 9,600 hours were needed for production. You are required to present the Flexible Budget Amount of each Overhead to enable appropriate comparison with the actual figures.

Solution: **1. Segregation of Overhead B into Fixed and Variable Elements**

(a) Variable OH = $\frac{₹\ 1,90,000 - ₹\ 1,40,000}{(6,000 - 4,000)\ \text{units}}$ = ₹ 25 pu.

(b) Fixed OH = ₹ 1,90,000 – (6,000 units × ₹ 25) = ₹ 40,000.

2. Flexible Budget for 5,000 units

Particulars		₹
OH A:	**Variable:** 5,000 units × 2 hrs pu × ₹ 12 ph **(Note 1)**	1,20,000
OH B:	**Variable:** 5,000 units × ₹ 25 pu	1,25,000
	Fixed:	40,000
OH C:	**Fixed:** (4,000 units × 2 hrs pu × ₹ 12.5 ph) (same at all levels) **(Note 2)**	1,00,000
Total		**3,85,000**

Note:

1. Actual Hours of 9,600 is not considered for Overhead A, since it constitutes Efficiency Variation.
2. It is assumed that processing time of 2 hours per unit, applies for Overhead 'C' also.

Question 1(d): Relevant Costing – Computation of Opportunity Costs (5 Marks)

A Company can produce any of its 4 Products, A, B, C and D. Only one product can be produced in a production period and this has to be determined at the beginning of the production run. The Production Capacity is 1,000 hours. Whatever is produced has to be sold and there is no Inventory build–up to be considered beyond the production period. The following information is given:

Particulars	A	B	C	D
Selling Price (₹ per unit)	40	50	60	70
Variable Cost (₹ per unit)	30	20	20	30

Particulars	A	B	C	D
No. of units that can be sold	1,000	600	900	600
No. of production hours required per unit of product	1 hour	1 hour and 15 minutes	1 hour and 15 minutes	2 hours

What are the Opportunity Costs of A, B, C and D?

Solution: **Similar to Page 4.8, Q.No.4**

Particulars	**A**	**B**	**C**	**D**
1. Contribution per unit = SP pu – VC pu	40 – 30 = ₹ 10	50 – 20 = ₹ 30	60 – 20 = ₹ 40	70 – 30 = ₹ 40
2. Time Required	1 hour	1.25 hours	1.25 hours	2 hours
3. Possible Production Point Qtty = (1000 hrs ÷ 2)	1,000 units	800 units	800 units	500 units
4. Possible Sale Quantity	1,000 units	600 units	900 units	600 units
5. Sales Quantity lost due to Production Constraint = 4 – 3, if 4 > 3.	Nil	NA	100 units	100 units
6. Opportunity Costs = (5 × 1)	**Nil**	**Nil**	**₹ 4,000**	**₹ 4,000**

Question 2(a): Pricing Policy (4 Marks)

State the appropriate Pricing Policy in each of the following independent situations:

Situation	**Answer, Reason and Reference**
(i) 'A' is a new product for the Company and the Market and meant for Large Scale Production and Long Term Survival in the Market. Demand is expected to be elastic.	Penetration Pricing (due to large scale production and elastic demand). **Page 3.10, Q.No.26, Point 4**
(ii) 'B' is a new product for the Company, but not for the Market. B's success is crucial for the Company's Survival in the Long Term.	Penetration Pricing (due to need for long–term survival). **Page 3.10, Q.No.26, Point 3**
(iii) 'C' is a new product to the Company and the Market. It has an Inelastic Market. There needs to be an assured Profit to cover high Initial Costs and the usual sources of Capital have uncertainties blocking them.	Skimming Pricing (due to inelastic demand, need for assured profit). **Page 3.9, Q.No.25, Point 1, 3**
(iv) 'D' is a perishable item, with more than 80% of its Shelf Life over.	Variable Costs Pricing (due to perishability, need to avoid total loss). **Page 3.3, Q.No.5, Point 1**

Question 2(b): Simulation (8 Marks)

A Bakery sells a popular brand of Bread. Cost Price per Bread is ₹ 16 and Selling Price per Bread is ₹ 20. Shelf Life of the Bread is 2 days and if it is not sold within two days, then it has no Sale Value at the end of second day. Daily demand based on past experience is as under:

Daily Demand	0	20	25	35	40	45
Probability	.01	.15	.30	.40	.10	.04

Consider the following sequence of Random Numbers: 58, 80, 51, 09, 47, 26, 64, 43, 86, 35

Using the sequence, simulate the Demand for the next 10 days and find out the total Profit or Loss for 10 days assuming 35 Breads are purchased every day in the morning and there is an Opening Stock of 5 Breads (purchased the previous day) on the 1st day morning. Assume LIFO basis (Last In First Out basis – where the fresh Bread is sold first).

Solution:

1. Random Number Table

Demand	**Probability**	**Cumulative Probability**	**Random Numbers**
0	0.01	0.01	00 – 00
20	0.15	0.16	01 – 15
25	0.30	0.46	16 – 45
35	0.40	0.86	46 – 85
40	0.10	0.96	86 – 95
45	0.04	1.00	96 – 99

2. Simulation Table

Day	R.No.	Demand	Opg. Stock	Purchase	Sale out of	Balance out of	Spoilage / Loss	Closing Stock
			(A)	(B)	(A + B)	(A + B)		
1	58	35	Given 5	35	0 + 35 = 35	5 + 0 = 5	5	Nil
2	80	35	Nil	35	NA + 35 = 35	Nil	Nil	Nil
3	51	35	Nil	35	NA + 35 = 35	Nil	Nil	Nil
4	09	20	Nil	35	NA + 20 = 20	NA + 15 = 15	Nil	15
5	47	35	15	35	Nil + 35 = 35	15 + 0 = 15	15	Nil
6	26	25	Nil	35	NA + 25 = 25	NA + 10 = 10	Nil	10
7	64	35	10	35	Nil + 35 = 35	10 + 0 = 10	10	Nil
8	43	25	Nil	35	NA + 25 = 25	NA + 10 = 10	Nil	10
9	86	40	10	35	(b/f) 5 + 35 = 40	5 + 0 = 5	5	Nil
10	35	25	Nil	35	NA + 25 = 25	NA + 10 = 10	Nil	10
				350	**310**		**35**	

Notes:

- Sale Quantity = **Least** of – (i) Demand, or (ii) Availability out of Opening Stock and that Day's Purchases. This Sale is separately identified as out of Opening Stock (A) and out of Current Day's Purchases (B).
- Balance Stock is also identified as out of Opening Stock (A) and out of Current Day's Purchases (B).
- Spoilage occurs when Balance Stock relates to purchases of previous day, i.e. out of (A).
- Closing Stock = Balance Quantity as computed above **less** Spoilage Quantity.

3.Computation of Profit

	Sales	= 310 Breads × ₹ 20 =₹ 6,200
(–)	Cost of Breads Sold	= 310 Breads × ₹ 16 = (₹ 4,960)
(–)	Cost of Spoilt Breads	= 35 Breads × ₹ 16 = (₹ 560)
Profit		**₹ 680**

Note: Alternatively, Total Cost of Breads can be computed as Opening Stock + Purchases – Closing Stock = 5 + 350 – 10 = 345 Breads at ₹ 16 pu.

Question 2(c): JIT – Performance Evaluation Criteria (4 Marks)

The following independent situations are given in JIT Systems of Production. You are required to state if each recommendation in valid or invalid and give a brief reason.

S. No.	Situation	Recommendation by the Cost Accountant
(i)	A Company produces LCD TVs. Presently total Inventory Turnover is measured annually	Compute Inventory Turnover every month. Break it down into Raw Material, WIP, expensive Inventory and Finished Goods.
(ii)	Textile Company	Accept Employees' Claim for Piece Rate Incentive for exceeding a certain Production Volume.
(iii)	Sports Goods manufacturing Company	Closely monitor Direct Labour Variances including Idle Time Variances to convince employees to work faster.
(iv)	Multiproduct Production	Monitor the Average Set Up Time per Machine in a period which is given by Aggregate Set Up Time of all Machines ÷ Total number of Machines.

Solution:

S.No.	Nature	Reason and Reference
(i)	**Valid**	Monthly Inventory Turnover Ratio, with breakup of Materials, WIP, etc. is a performance measurement criterion relevant to JIT. **[Refer Page 13.6, Q.No.16, Point 1]**
(ii)	**Invalid**	JIT System focusses on producing only what is needed, so an Employee who has incentives to create vast piles of parts, operates contrary to the rules of the system. **[Refer Page 13.6, Q.No.15, Point 2]**
(iii)	**Invalid**	JIT System does not focus on how fast an Employee works, but only on the quality of the products manufactured. **[Refer Page 13.6, Q.No.15, Point 3]**
(iv)	**Valid**	Set–up Time Reduction is a performance measurement criterion relevant to JIT. **[Refer Page 13.6, Q.No.16, Point 2]**

Question 3(a): Transport Services – Airlines – BEP, Special Offer Evaluation (12 Marks)

Flyway Ltd has hired an Aircraft to specially operate between Cities A and B. All the seats are economy class. The following information is available:

Seating Capacity of the Aircraft	260 Passengers
Average Number of Passengers per Flight	240 Passengers
Average one–way fare from A to B	₹ 5,000 per Passenger
Fuel Costs per Flight from A to B	₹ 90,000
Food Cost (A to B sector) (no charge to Passenger)	₹ 300 per Passenger
Commission to Travel Agents (All tickets are through Agents)	10% of the Fare
Annual Lease Costs allocated to each Flight	₹ 2,00,000
Ground services, Baggage Handling / Checking–in Service Costs per Flight A to B	₹ 40,000
Flight Crew Salaries per Flight A to B	₹ 48,000

There is an offer from another Airlines Operator, Haltgo Ltd, for a stop–over at destination D, which is on the way from A to B. Due to this, the Flight will operate from A to D, then from D to B. The following terms are considered for the stop–over:

- 50 Seats from D to B will be booked by Haltgo at ₹ 2,700 per ticket, whether or not Haltgo is able to sell them to its customers. No Agents' Commission is payable on these tickets. However, Snacks must be provided to these passengers also by Flyway Ltd at no further charge to Haltgo or the Passengers.
- A Maximum of 60 tickets can be sold by Flyway's Travel Agents for the A to D Sector at a Fare of ₹ 3,000 per Passenger.
- Since the stop–over wastes more times, 25 of Flyway's original passengers in the A to B Sector will voluntarily drop out in favour of other Airlines offering direct Flights between A and B.
- Due to the stop–over, Fuel Costs will increase from ₹ 90,000 to ₹ 1,35,000. Additional Airport Landing / Baggage Handling Charges of ₹ 19,000 per stop–over will have to be incurred by Flyway Ltd.
- Flyway Ltd will have to serve snacks to all the Passengers in the D to B Sector at no charge to Passengers. Each snack will cost Flyway ₹ 200. This will be in addition to the original food at ₹ 300 served in the A to D sector.
- You may assume that fuel costs are not affected by the actual number of passengers in the Flight, ignore non–financial considerations, additional wear and tear to aircraft due to extra landing / take–off.

1. Without considering Haltgo's offer,
   (i) What is the Profit earned by Flyway Ltd per Flight from A to B?
   (ii) What is the Break–Even number of Passengers for each Flight from A to B?
2. Considering the effects of Haltgo's offer, evaluate whether Flyway should accept the offer. (A detailed profitability statement is not essential. Only figures relevant for the Cost–Revenue Analysis are required.)

Solution: **Similar to Page 6.10, Q.No.6**

1. Without considering Haltgo's Offer

Profit Statement			₹	Computation of Break Even No. of Passengers
	Revenue ₹ 5,000 × 240 Passengers		12,00,000	(a) For Break Even purposes, Fixed Costs to be recovered per Flight = ₹ 2,88,000 + Fuel ₹ 90,000 = ₹ 3,78,000
Less:	Variable Costs:			(b) Net Contribution per Passenger = Revenue ₹ 5,000 less Food ₹ 300 less Commission ₹ 500 = ₹ 4,200.
	Fuel	90,000		(c) Break Even Number of Passengers = ₹ 3,78,000 ÷ ₹ 4,200 **= 90 Passengers** per Flight.
	Food (₹ 300 × 240)	72,000		
	Commission 10%	1,20,000	2,82,000	
	Contribution per Flight A to B		**9,18,000**	
Less:	Fixed Costs			**Note:** It is assumed that all costs and revenues per flight will behave evenly throughout the financial period.
	Lease Costs	2,00,000		
	Ground Services	40,000		
	Crew Salaries	48,000	2,88,000	
	Profit per Flight A to B		**6,30,000**	

2. Evaluation of Haltgo's Offer

(Summary evaluation using Incremental Benefits / Costs)

Particulars	₹
Incremental Benefits:	
Additional Revenue from A to D Sector (60 passengers at ₹ 3,000)	1,80,000
Additional Revenue in D to B Sector from Haltgo (50 seats at ₹ 2,700)	1,35,000
Total (A)	**2,45,000**
Incremental Costs:	
Additional Costs on A to D Sector for 60 passengers (Food ₹ 300 + Commission 10% ₹ 300) = 60 × ₹ 600	36,000
Additional Fuel Costs (given)	45,000
Additional Airport Landing / Baggage Handling Costs (given)	19,000
Additional Food Costs (Earlier 240 less Dropout 25 + New D to B 50) = 265 Passengers at ₹ 200	53,000
Opportunity Cost on Dropouts (25 Passengers at ₹ 4,200)	1,05,000
Total (B)	**2,58,000**
Net Benefit / (Cost) (A – B)	**57,000**

Conclusion: Offer from Haltgo is worthwhile. [**Note:** Alternative assumptions / methods of computations are possible.]

Question 3(b): Uniform Costing – Theory (4 Marks)

What are the limitations of Uniform Costing?

Solution: **Refer Page 15.3, Q.No.6**

Question 4(a): Transfer Pricing (12 Marks)

B Ltd makes three products X, Y and Z in Divisions X, Y and Z respectively. The following information is given:

Particulars	X	Y	Z
Direct Material (₹ per unit) (excluding Material X for Divisions Y and Z)	8	22	40
Direct Labour (₹ per unit)	4	6	8
Variable Overhead (₹ per Unit)	2	2	2
Selling price to outside customers (₹ per unit)	25	65	90
Existing Capacity (No. of units)	6,000	3,000	3,000
Maximum External Market Demand (No. of units)	5,000	5,500	5,000
Additional Fixed Cost that would be incurred to install Additional Capacity (₹)	45,000	9,000	23,100
Maximum Additional Units that can be produced by Additional Capacity (No. of units)	6,000	2,000	2,250

Y and Z need Material X as their input. Material X is available in the Market at ₹ 23 per unit. Defectives can be returned to Suppliers at their Cost. Division X supplies the material free from Defects and hence is able to sell at ₹ 25 per unit. Each unit of Y and Z require one unit of X as input with slight modification.

If Y purchases from outside at ₹ 23 per unit, it has to incur ₹ 3 per unit as Modification and Inspection Cost. If Y purchases from Division X, it has to incur, in addition to the Transfer Price, ₹ 2 per unit to modify it.

If Z gets the material from Division X, it can use it after incurring a Modification Cost of ₹ 1 per unit. If Z buys Material X from outside, it has to either inspect and modify it at its own Shop Floor at ₹ 5 per unit or use Idle Labour from Division X at ₹ 3 per unit. Division X will lend its Idle Labour as per Z's requirement even if Z purchases the Material from outside.

The Transfer Prices are at the discretion of the Divisional Managers and will remain confidential. Assume no restriction on quantities of inter–division transfers or Purchases.

Discuss with relevant figures the best strategy for each division and of the Company as a whole.

Solution: **Similar to Page 5.48, Q.No.33**

1. **Best Strategy for Y:**
   (a) Effective Cost pu of External Purchase = Purchase ₹ 23 + Modification & Inspection ₹ 3 = ₹ 26 pu.
   (b) So, Y will not pay X anything more than ₹ 24, i.e. External Effective Cost ₹ 26 **less** Modification Cost of Internal Transfer ₹ 2. (If TP > ₹ 24, B will prefer external purchase of Materials.)

2. **Best Strategy for Z:** The costs of different options relating to materials are as under –

Option	Cost per unit
(a) Buy externally, and inspect it at its own Shop Floor	₹ 23 + ₹ 5 = ₹ 28
(b) Buy externally, and use Division X Labour for inspection	₹ 23 + ₹ 3 = ₹ 26
(c) Buy internally from Division X (Price Payable internally (to be computed)+ Modification Cost)	₹ X + ₹ 1

Since, Effective External Buying Cost is ₹ 26 as per Option (b) above, Division Z will be ready to pay Division Z a maximum price of ₹ 25 (being External Effective Cost ₹ 26 **less** Modification Cost of Internal Transfer ₹ 1)

Note: It is specified that Transfer Prices are at the discretion of the Division Managers and will remain confidential. This is assumed so as to mean differential Transfer Prices for different departments in this case ₹ 24 for Division Y and ₹ 25 for Division Z.

Alternative View: It can be assumed that Internal TP for Y and Z is uniform, and hence TP for Z = TP for Y = ₹ 24 pu as per **WN 1** above.

3. **Best Strategy for X and Company as a whole:**

Particulars	X	Y	Z
(a) Sale Price per unit	For Z & External: ₹ 25 For Y: ₹ 24	External: ₹ 65	External: ₹ 90
(b) Variable Cost per unit = Transfer in Cost + Materials + Labour + VOH	Nil + 8 + 4 + 2 = ₹ 14	(24+2)+22+6+2 = ₹ 56	(25+1)+40+8+2 = ₹ 76
(c) Contribution per unit	For Z & External: ₹ 11 For Y: ₹ 10	External: ₹ 9	External: ₹ 14
(d) Maximum External Demand	5,000 units	5,500 units	5,000 units
(e) Existing Capacity	6,000 units	3,000 units	3,000 units
(f) Maximum Capacity that can be added	6,000 units	2,000 units	2,250 units
(g) Total Maximum Capacity possible (e+f)	12,000 units	5,000 units	5,250 units
(h) Additional Fixed Cost on expansion	₹ 45,000	₹ 9,000	₹ 23,100
(i) Quantity that must be sold / transferred to get this amount as contribution	$\frac{45,000}{10}$ = 4,500	$\frac{9,000}{9}$ = 1,000	$\frac{23,100}{14}$ = 1,650
(j) External Demand not covered by existing capacity	Nil	2,500	2,000
(k) Decision [See Note below]	Expand capacity and Make 12,000 units, Sell 5,000 outside, 5,000 to Z & 2,000 to Y	Expand capacity, Make 2,000 units with internal purc. X and balance with market purchase.	Expand upto 5,000 units, i.e. max. external demand & purc. X internally.

Note: As per X's best strategy, output available for transfer to other Divisions will be – (a) first 5,000 units to Division Z (being higher contribution), and (b) balance 2,000 units for Division Y.

From the Company's overall viewpoint, cost of output produced in Divisions Y and Z based on internally transferred X, and externally purchased X will be as under –

	Division Y		Division Z	
Use of	Internally purchased X	Externally purchased X	Internally purchased X	Externally purchased X
Relevant Cost of Final Product	14 + 2 + 22 + 6 + 2 = 46	23 + 3 + 22 + 6 + 2 = 56	14 + 1 + 40 + 8 + 2 = 65	23 + 3 + 40 + 8 + 2 = 76

From the above, it can be inferred that that first preference should be given for internal transfer of X, and the balance requirements of Divisions Y and Z will be purchased from the outside market.

Revenue Impact of the above decision will be –

Particulars	X	Y	Z	Total
Contribution	Extrl: (5,000 × ₹ 11) + Z: (5,000 × ₹ 11)+ Y: (2,000 × ₹ 10) = 1,60,000	Same Cost for both internally and externally sourced material (WN 1) So, Uniform Contribution for all output = (5,000 × ₹ 9) = 45,000	(5,000×₹ 14) = 70,000	2,75,000
Additional Fixed Cost	45,000	9,000	23,100	77,100
Net Additional Benefit	**1,15,000**	**36,000**	**46,900**	**97,900**

Question 4(b): Learning Curve Concept - Applicability (4 Marks)

State whether the Learning Curve Theory can be applied to the following independent situations briefly justifying your decision:

Situation	Answer, Reason and Reference
(i) A Labour–intensive sculpted product is carved from the Metal provided to the staff. The Metal is sourced from different Suppliers since it is scarce. The alloy composition of the Input Metal is quite different among the Suppliers.	Not Applicable (slight change in composition of Metal.) **Page 20.2, Q.No.5, Point 1(c), 4**
(ii) Pieces of hand–made Furniture are assembled by the Company in a far–off location. The Labourers do not know anything about the Final Product which utilizes their work. As a matter of further precaution, rotation of Labour is done frequently.	Not Applicable (Frequent rotation of labour). **Page 20.2, Q.No.5, Point 1**
(iii) Skilled Workers have been employed for long time. The Company has adequate market for the Craft Pieces done by these experts.	Not Applicable (already experienced) **Page 20.2, Q.No.5, Point 1**
(iv) A Company finds that it always has an adverse usage of Indirect Material. It wants to apply Learning Curve Theory to improve the way standards have been set.	Applicable (new activities not performed in present operational mode) **Page 20.2, Q.No.5, Point 1**

Question 5(a): Standard Costing – Labour Cost Variances (8 Marks)

The following information relates to the Labour Element of X Ltd.

Type of Labour	Skilled	Semi–Skilled	Unskilled	Total
No. of Workers in the Standard Gang	4	3	2	9
Standard Rate per hour (₹)	6	3	1	
Number of Workers in Actual Gang				9
Actual Rate per hour (₹)	7	2	2	

In a 40 hour Week, the Gang produced 270 Standard Hours. The Actual number of Semi–skilled Workers is two times the Actual number of Unskilled Workers. The Rate Variance of Semi–skilled Workers is ₹ 160 (F).

Find the following:

(i) The Number of Workers in each Category.
(ii) Total Gang Variance.
(iii) Total Sub–Efficiency Variance.
(iv) Total Labour Rate Variance

Indicate if the Variance are Favourable (F) or Adverse (A or U).

Solution:

1. LRV for Semi–Skilled Workers = AH × (SR – AR) = AH × (3 – 2) = 160F.
   Hence, AH of Semi–skilled Workers = 160 hours.
2. Since the data pertains to 40 hour week, actual number of Semi–skilled Workers = $\frac{160\ (WN1)}{40\ hours}$ = **4 Workers**.
3. Actual No. of unskilled workers = ½ × 4 = **2 Workers.**
4. Hence, Actual Number of Skilled Workers = Total 9 – (Semi–skilled 4 & Unskilled 2) = **3 Workers.**

5. Labour Variances are computed as under

	SH × SR	RAH × SR	AH × SR	AH × AR
SK	120 × 6 = 720	160 × 6 = 960	(3 × 40) × 6 = 720	(3 × 40) × 7 = 840
SSK	90 × 3 = 270	120 × 3 = 360	(4 × 40) × 3 = 480	(4 × 40) × 2 = 320
USK	60 × 1 = 60	80 × 1 = 80	(2 × 40) × 1 = 80	(2 × 40) × 2 = 160
Tot	**1,050**	**1,400**	**1,280**	**1,320**

Labour **Sub– Efficiency** Variance = ₹ 1,050 – ₹ 1,400 **= ₹ 350 A** + Labour **Mix** Variance = ₹ 1,400 – ₹ 1,280 **= ₹ 120 F** + Labour **Rate** Variance = ₹ 1,280 – ₹ 1,320 **= ₹ 40 A**

Labour **Efficiency** Variance = ₹ 1,050 – ₹ 1,280 = **₹ 230 A** + Labour **Rate** Variance b/fd as above **= ₹ 40 A**

Total Labour Cost Variance = ₹ 1,050 – ₹ 1,320 = **₹ 270 A**

SH: 270 hours distributed in 4:3:2 ratio = 120, 90 and 60 hours respectively.
RAH: 9 Workers × 40 hours = 360 hours in 4:3:2 ratio = 160, 120, 80 hours respectively.

Question 5(b): LPP – Simplex Method – Final Table Interpretations (8 Marks)

Given below is an iteration in a Simplex Table for a Maximization Objective linear programming product mix problem for product X_1, X_2, and X_3.

C_j			6	4	10	0	0	0
	Basic Variable	Quantity	X_1	X_2	X_3	S_1	S_2	S_3
0	S_1	400	0	4/3	0	1	–1/3	0
6	X_1	400	1	2/3	2	0	1/3	0
0	S_3	400	0	5/3	0	0	–2/3	1
	Z_j	2400	6	4	12	0	2	0
	$C_j – z_j$		0	0	–2	0	–2	0

Answer the following questions:

(i) Is the above solution feasible?

(ii) Perform one more Iteration with X_2 entering the solution to get a solution with the same value for the Objective Function.

(iii) Indicate the Shadow Prices.

(iv) If Customer is prepared to pay higher price for product X_3, then by how much should the Price be increased so that the Company's Profit remains unchanged?

(v) From the given Table, derive any one original constraint inequality with the coefficient of variables in their simplest whole number forms.

Solution:

(i) Since, all NER ≤ 0 for Maximisation objective, the above Table/ Solution is **optimal**, and also as there are no Artificial Variables, the solution is **feasible**.

(ii) Since, Non Program Variable X_2 has NER = 0, there is another alternative solution, with same value for the objective function. This is as under –

FR	Program	Profit	Quantity	X_1	X_2	X_3	S_1	S_2	S_3	Repl. Ratio
4/5	**S_1**	0	400	0	4/3	0	1	– 1/3	0	400 ÷ 4/3 = 300
2/5	**X_1**	6	400	1	2/3	2	0	1/3	0	400 ÷ 2/3 = 600
NA	**S_3**	0	400	0	5/3	0	0	– 2/3	1	400 ÷ 5/3 = **240** **(min non–ve)**
Decision: **In** = Key Column = X_2 **Out**= Key Row = S_3			**Net Evaluation Row (given)**	0	**0** max +ve	– 2	0	– 2	0	

Alternative Optimal Table / Solution

FR	Program	Profit	Quantity	X_1	X_2	X_3	S_1	S_2	S_3	Repl. Ratio
	S_1	0	80	0	0	0	1	1/5	– 4/5	
	X_1	6	240	1	0	2	0	3/5	– 2/5	
	X_2	4	240	0	1	0	0	– 2/5	3/5	
			NER	0	0	– 2	0	– 2	0	

Answer: X_1 = 240 units, X_2 = 240 units, Maximum Z = (6 × 240) + (4 × 240) = **2,400.**

Working Notes:

Note: For Non–Key Rows, A = (Previous Table Corresponding Row Element) **Less** B = (Key Row Element × Fixed Ratio)

Computation for S_1 Row								**Computation for X_1 Row**							
A	400	0	4/3	0	1	– 1/3	0	**A**	400	1	2/3	2	0	1/3	0
– B	320	0	4/3	0	0	– 8/15	4/5	**– B**	160	0	2/3	0	0	– 4/15	2/5
A–B	80	0	0	0	1	1/5	– 4/5	**A–B**	240	1	0	2	0	3/5	– 2/5

(iii) **Shadow Prices:** S_1 = Nil, S_2 = 2, S_3 **=** Nil. (based on NER).

(iv) **Price Increase:** Since NER of X_3 is –2, Price of X_3 should be increased by **₹ 2** to maintain same profit.

(v) **Constraint Inequality:**

- The Initial Table would have been prepared with Slacks S_1, S_2, and S_3 as Basic Variables.
- Since, X_1 is obtained in 2nd Row of the given Table in the question, it can be inferred that S_2 has been replaced by X_1 in this iteration. So, S_2 must have been the Key Row in the First Table, having '1' as the entry against S_2 Column (to form Unit Matrix).
- The Rule for transformation of Key Row is Previous Table Element ÷ Pivot Element. Since entry against S_2 Column in the given Table is 1/3, it can be inferred that the Pivot Element of the Previous Table is '3'.
- Hence, the entries in S2 Row in the First Table would have been –

Quantity	X_1	X_2	X_3	S_1	S_2	S_3
400 × 3 = 1200	1 × 3 = 3	2/3 × 3 = 2	2 × 3 = 6	0 × 3 = 0	1/3 × 3 = 1	0 × 3 = 0

Hence, the Original Constraint Inequality must be $3X_1 + 2X_2 + 6X_3 \leq 1200$ ——— 2nd Constraint.

Question 6(a): Activity Based Costing – OH Cost Computation (8 Marks)

MK Ltd manufactures Four Products, namely A, B, C and D using the same Plant and Process. The following information relates to a Production Period:

Product	A	B	C	D
Output in units	720	600	480	504

The four Products are similar and are usually produced in production runs of 24 units and Sold in batches of 12 units. The Total Overheads incurred by the Company for the period are as follows:

	₹
Machine Operation and Maintenance Cost	63,000
Setup Costs	20,000
Store Receiving	15,000
Inspection	10,000
Material Handling and Dispatch	2,592

During the period the following Cost Drivers are to be used for the Overhead Cost:

Cost	Cost Driver
Setup Cost	No. of Production Runs
Store Receiving	Requisitions Raised
Inspection	No. of Production Runs
Material Handling and Dispatch	Orders Executed

It is also determined that:

- Machine Operation and Maintenance Cost should be apportioned between Setup Cost, Store Receiving and Inspection Activity in the ratio 4 : 3: 2.
- Number of requisition raised on store is 50 for each Product and the No. of orders executed is 192, each order being for a batch of 12 units of a Product.

Calculate the Total Overhead Cost per unit of each product using Activity Based Costing after finding activity wise Overheads allocated to each Product.

Solution: **Same as Page 8.19, Q.No.8**

1. Computation of ABC Recovery Rates

Activity	Activity Cost Pool	Cost Driver	Quantity	ABC Rate
Set Up	20,000+ 28,000 = ₹ 48,000	No. of Production Runs	96	₹ 500 per Run
Stores Receiving	15,000+ 21,000 = ₹ 36,000	Requisitions raised	50 ×4= 200	₹ 180 per Reqn.
Inspection	10,000+ 14,000 = ₹ 24,000	No. of Production Runs	96	₹ 250 per Run
Material Handling	Given = ₹ 2,592	Orders executed	192	₹ 13.5 per Batch

Note:

- Machine Operation and Maintenance Cost of ₹ 63,000 is apportioned to the first three activities in the ratio 4:3:2, i.e. ₹ 28,000, ₹ 21,000 and ₹ 14,000
- Number of Production Runs and Number of Batches are computed as under –

Product	A	B	C	D	Total
(a) Output Quantity	720 units	600 units	480 units	504 units	
(b) Quantity per Production Run	24 units	24 units	24 units	24 units	
(c) Number of Production Runs (a ÷ b)	30 runs	25 runs	20 runs	21 runs	96 runs
(d) Quantity per Batch Order	12 units	12 units	12 units	12 units	
(e) Number of Batches (a ÷ d)	60 batches	50 batches	40 batches	42 batches	192 batches

2.Computation of OH Costs using ABC System

Product	A	B	C	D	Total
• Set up	500×30=₹ 15,000	500×25= ₹ 12,500	500×20=₹ 10,000	500×21=₹ 10,500	₹ 48,000
• Stores Recvg.	₹ 9,000	₹ 9,000	₹ 9,000	₹ 9,000	₹ 36,000
• Inspection	250×30 =₹ 7,500	250×25 =₹ 6,250	250× 20 =₹ 5,000	250 × 21= ₹ 5,250	₹ 24,000
• Matl Handling	13.50×60 = ₹ 810	13.50×50= ₹ 675	13.50×40=₹ 540	13.50×42=₹ 567	₹ 2,592
(a) Total OH Cost	₹ 32,310	₹ 28,425	₹ 24,540	₹ 25,317	₹ 1,10,592
(b) Output Quantity	720 units	600 units	480 units	504 units	
(c) **OH Cost p.u.**	**₹ 44.875**	**₹ 47.375**	**₹ 51.125**	**₹ 50.232**	

Question 6(b): PERT Network Analysis – Probability Computations (8 Marks)

A Project consists of seven activities whose time estimates (Optimistic – t_o, Pessimistic – t_p and most likely – t_m) in days are given below:

Activity	t_o	t_p	t_m
1–2	1	5	3
1–3	1	7	4
1–4	2	10	6
2–5	2	8	2
3–5	3	15	6
4–6	2	8	5
5–6	2	14	5

Required:

(i) Draw the Network and find out the expected time and variance for each activity. What is the expected duration for completion of the Project?

(ii) If the Target Time is 22 days, what is the Probability of not meeting the Target?

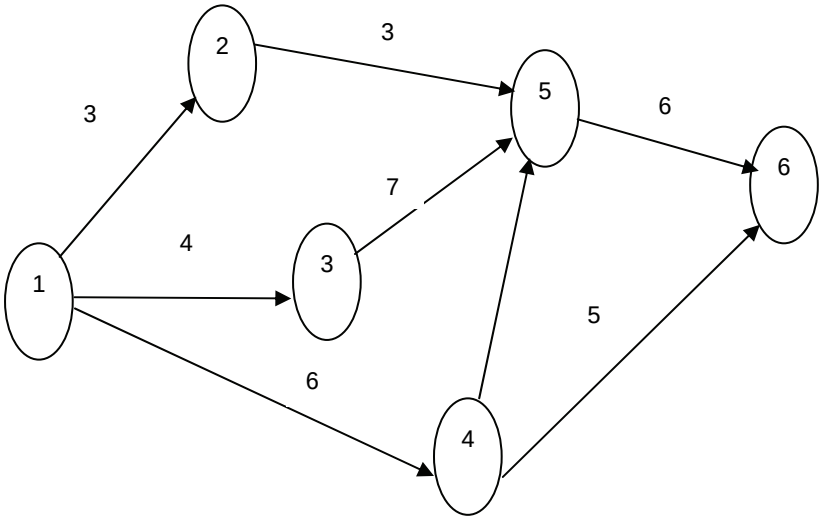
(iii) Within how many days can the Project be expected to be completed with 99 Percent chance?

Give $Z_{2.33} = 0.9901$ and $Z_{1.67} = 0.9525$

Solution: **1.Network Table**

Activity	$t_e = \frac{t_o + 4t_m + t_p}{6}$	Variance $(\frac{t_p - t_o}{6})^2$
1 – 2	3	$(\frac{5-1}{6})^2 = 4/9$
1 – 3	4	$(\frac{7-1}{6})^2 = 1$
1 – 4	6	$(\frac{10-2}{6})^2 = 16/9$
2 – 5	3	$(\frac{8-2}{6})^2 = 1$
3 – 5	7	$(\frac{15-3}{6})^2 = 4$
4 – 6	5	$(\frac{8-2}{6})^2 = 1$
5 – 6	6	$(\frac{14-2}{6})^2 = 4$

2.Network Diagram



3. Paths Table (to identify Critical Path)

Paths	Duration
1 – 2 – 5 – 6	3 + 3 + 6 = 12
1 – 3 – 5 – 6	4 + 7 + 6 = 17
1 – 4 – 6	6 + 5 = 11

Expected Duration for Completion = Critical Path = 17 days (longest path). Variance of Critical Path = 1 + 4 + 4 = 9.
So, Standard Deviation of Critical Path = $\sqrt{9}$ = 3 Days.

4. Probability of completion within 22 days: $Z = \frac{t_r - t_{cp}}{SD_{cp}} = \frac{22-17}{3} = \frac{5}{3} = 1.67$. Given $Z_{1.67} = 0.9525$

So, **Probability of not completing within 22 days** = 1 – 0.9525 = 0.0475 = **4.75%**

5. For 99% Chance, given $Z_{2.33} = 0.9901$. So, $\frac{t_r - t_{cp}}{SD_{cp}} = 2.33$ So, $\frac{t_r - 17}{3} = 2.33$

Hence, $t_r = 6.99 + 17 = 23.99$. So the Project can be expected to be completed within 24 days, for 99% chance.

Question 7(a): Costing of Service Sector (4 Marks)

Discuss briefly two methods of costing in the Service Sector and give examples.

Solution: **Refer Page 6.2, Q.No. 3**

Question 7(b): Value Chain Activities – Classification of Activities (4 Marks)

In Value Chain Analysis, Business Activities are classified into Primary Activities and Support Activities. Classify the following under the more appropriate Activity.

Activity	**Answer Classification**
(i) Order Processing and Distribution	**Primary**
(ii) Installation, Repair and Parts Replacement	**Primary**
(iii) Purchase of Raw Material and other Consumable Stores	**Support**
(iv) Transforming Inputs into Final Products	**Primary**
(v) Selection, Promotion, Appraisal and Employee Relations	**Support**
(vi) Material Handling and Warehousing	**Primary**
(vii) General Management, Planning, Finance, Accounting	**Primary**
(viii) Communication, Pricing and Channel Management	**Support**

Note: For Classification Principles, refer Page 14.1 Q.No.3

Question 7(c): Transportation – Meaning of Terms (4 Marks)

Define the following terms in relation to a Transportation Problem: (i) Degeneracy, (ii) Prohibited Routes

Solution: **Refer Page 17.4**

Question 7(d): Relevant Costing – Cost Classification (4 Marks)

State the type of Cost on the following cases:

Description	**Answer Cost Type**
(i) Cost associated with the Acquisition and Conversion of Material into Finished Product.	Conversion Cost / Factory Cost
(ii) Cost arising from a prior decision which cannot be changed in the short run.	Sunk Cost / Committed Cost.
(iii) Increase in Cost resulting from selection of one alternative instead of another.	Incremental Cost / Opportunity Cost / Differential Cost.
(iv) Rent paid for a Factory Building which is temporarily closed.	Unavoidable Cost / Committed Fixed Cost / Shut–Down Costs.

Note: For Cost Types and Meanings, refer Chapter 4.

Question 7(e): Budgetary Control – ZBB vs Traditional Budgeting (4 Marks)

In each of the following independent situations, state with a brief reason whether 'Zero Base Budgeting' (ZBB) or 'Traditional Budgeting' (TB) would be more appropriate for Year II.

Description	**Answer, Reason and Reference**
(i) A Company producing a certain Product has done extensive ZBB exercise in Year I. The activity level is expected to marginally increase in Year II.	**ZBB.** (It is **decision–oriented**, in a rational manner, for allocation of resources for both old and new programmes & activities.) **[Page 7.6 Q.No.17, Point 1 ZBB]**
(ii) The Sales Manager of a Company selling three products has the intuitive feeling that in year II, Sales will increase for one Product and decrease for the other two. His expectation cannot be substantiated with figures.	**TB.** (In ZBB, Manager of each Division should completely justify why there should be a budget allocation for his Division. Here it cannot be substantiated with figures.) **[Page 7.6 Q.No.17, Point 4 ZBB]**
(iii) The Top Management would like to delegate responsibility to the Functional Managers for their results during Year II.	**ZBB (**Manager of each Division should completely justify his Budget, Top Management only accords approval.) **[Page 7.6 Q.No.17, Point 4,6 ZBB]**
(iv) Resources are heavily constrained and allocation for Budget requirements is very strict.	**TB.** (It is for **Top Management** to decide why a particular amount should be spent on a particular decision unit.) **[Page 7.6 Q.No.17, Point 4 TB]**

Note: Alternative view / arguments in favour of the other method of Budgeting is also possible.

STUDENTS' NOTES