Guideline Answers to Nov 2012 Exam CA Final Advanced Management Accounting

Question 1 is compulsory **(4 × 5 = 20 Marks)**
Answer **any five** questions from the **remaining six** questions **(16 × 5 = 80 Marks).** [Answer any 4 out of 5 in Q.7]

1(a): Relevant Costing – Shut–down vs Continue N 12 (5 Marks)

If Moonlite Limited operates its Plant at normal capacity it produces 2,00,000 units from the Plant 'Meghdoot'. The unit cost of manufacturing at normal capacity is as under –

Particulars	₹
Direct Material	65
Direct Labour	30
Variable Overhead	33
Fixed Overhead	7
Total	135

Direct Labour Cost represents the compensation to highly–skilled workers, who are permanent employees of the Company. The Company cannot afford to lose them. One labour hour is required to complete one unit of the product.

The Company sells its product for ₹ 200 per unit with Variable Selling Expenses of ₹ 16 per unit. The Company estimates that due to economic down turn, it will not be able to operate the Plant at the normal capacity, at least during the next year. It is evaluating the feasibility of shutting down the Plant temporarily for one year.

If it shuts down the Plant, the Fixed Manufacturing Overhead will be reduced to ₹ 1,25,000. The Overhead Costs are incurred at a uniform rate throughout the year. It is also estimated that the additional cost of shutting down will be ₹ 50,000 and the cost re–opening will be ₹ 1,00,000.

Required: Calculate the minimum level of production at which it will be economically beneficial to continue to operate the Plant next year, if 50% of the Labour hours can be utilized in another activity, which is expected to contribute at the rate of ₹ 40 per Labour hour. The additional activity will relate to a job which will be off–loaded by a Sister Company, only if the Company decided to shut down the Plant. (Assume that the cost structure will remain unchanged next year. Ignore Income Tax and Time Value of Money).

Solution:

Note: Direct Labour Cost is committed & irrelevant, since the Company cannot afford to lose the highly skilled permanent workers.

Effective Contribution p.u. = Selling Price p.u. – Variable Cost p.u. = ₹ 200 – ₹ 65 Material – ₹ 33 VOH – ₹ 16 SOH = ₹ 86

Let required Minimum Output to justify Operation = Q units.

Particulars	**Continue**	**Close down**
1. **Benefit = Contribution**	Q units × ₹ 86	50% × 2,00,000 hrs × ₹ 40 p.h = ₹ 40,00,000
2. **Costs**		
(a) Fixed Overhead	₹ 7 p.u. × 2,00,000 units = ₹ 14,00,000	1,25,000
(b) Shut down and Re–opening Costs	–	₹ 50,000, + ₹ 1,00,000 = ₹ 1,50,000
Net Benefit	**86Q –14,00,000**	**37,25,000**

Solving for Q: 86Q – 14,00,000 = 37,25,000. 86Q = 51,25,000. So, Q = $\frac{51,25,000}{86}$ = **59,593 units.**

Conclusion: Plant can be continued, if expected sales **≥ 59,593 units.**

1(b): LPP Formulation – Investment Planning N 12 (5 Marks)

An Investor is interested in investing ₹ 15,00,000 in a portfolio of Investments. The investment choices and expected rates of return on each one of them are –

Investment	Mutual Fund 'XY'	Mutual Fund 'MN'	Money Market Fund	Government Bonds	Share 'P'	Share 'Q'
Projected Rate of Return	15%	9%	8%	8.75%	17%	18%

The Investor wants at least 40% of his Investment in Government Bonds. Because of the higher perceived risk of the two Shares, he has specified that the combined Investment in these two Shares not to exceed ₹ 2,60,000. The Investor has also specified that at least 25% of the Investment should be in the Money Market Fund and that the amount of money invested in Shares should not exceed the amount invested in Mutual Funds. His final investment condition is that the amount invested in Mutual Fund 'XY' should be no more than the amount invested in Mutual Fund 'MN'. The problem is to decide the amount of money to invest in each alternative so as to obtain the highest annual total return.

Required: Formulate the above as a Linear Programming Problem.

Solution: Let Amount of Investments in the above be A, B, C, D, E, F respectively.
Maximise Z = 0.15A + 0.09B + 0.08C + 0.0875 D + 0.17E + 0.18F ……**(Objective Function)**

Subject to the following constraints –

Assuming Investment ≤ ₹ 15,00,000	**Assuming Investment = Exactly ₹ 15,00,000**	**Remarks**
A + B + C + D + E + F ≤ 15,00,000	A + B + C + D + E + F = 15,00,000	Funds Availabilty
D ≥ 40% (A + B + C + D + E + F) So, – 0.4A – 0.4B – 0.4C + 0.6D – 0.4E – 0.4F ≥ 0	D ≥ 40% of 15,00,000 So, D ≥ 6,00,000	Govt. Bonds Condition
E + F ≤ 2,60,000	E + F ≤ 2,60,000	Share Invt. Condition
C ≥ 25% (A + B + C + D + E + F) So, – 0.25A – 0.25B + 0.75C – 0.25D – 0.25E – 0.25F ≥ 0	C ≥ 25% of 15,00,000 C ≥ 3,75,000	Money Market Fund Condition
E + F ≤ A + B So, – A – B + E + F ≤ 0	E + F ≤ A + B So, – A – B + E + F ≤ 0	Shares vs Mutual Fund
A ≤ B	A ≤ B	Mutual Fund Condition
A, B, C, D, E, F ≥ 0	A, B, C, D, E, F ≥ 0	Non–Negativity Assumption

1(c): ABC – Product Profit Statement N 12 (10 Marks)

PQR Limited sells two versions: Deluxe and Premium of its only product GoGo Juicer. The GoGo Juicer uses patented technology to extract the last drop of juice from most fruits. The 'Premium' version can handle larger fruit and has more options relative to the 'Deluxe' version. The following table provides the financial results of the most recent year of operations –

Particulars	Deluxe 90,000 units	Premium 10,000 units	Total 1,00,000 units
Revenue (₹)	63,00,000	9,00,000	72,00,000
Material Cost (₹)	10,80,000	2,50,000	13,30,000
Direct Labour Cost (₹)	14,40,000	1,60,000	16,00,000
Contribution Margin (₹)	37,80,000	4,90,000	42,70,000
Allocated Fixed Manufacturing Overheads (₹)	34,20,000	3,80,000	38,00,000
Allocated Fixed Selling and Administrative OH (₹)	2,51,563	35,937	2,87,500
Profit Margin (₹)	1,08,437	74,063	1,82,500
Profit Margin per unit (₹)	1.2048	7.4063	

Labour Cost is ₹ 16 per hour and each product requires one hour of labour. The Company currently allocates all Fixed Manufacturing Overheads, using Labour Hours as the allocation basis. It allocates Fixed Selling and Administrative Overheads, using Revenue as the Allocation Base.

Although the Profit Margin per unit of 'Deluxe' Juicer is rather low, PQR Limited believes that it is important to keep this model in the product mix. However, PQR can tailor its promotion and sales strategies to improve the sales mix to 16 : 4 ratio from the current 9 : 1 ratio of 'Deluxe' to 'Premium' Juicers, with total volume staying at 1,00,000 units.

PQR Limited finds that ₹ 1.1 Million of the ₹ 3.8 Million of Fixed Manufacturing Overheads pertains to batch related activities such as scheduling production runs. Similarly, ₹ 1,15,000 is the amount of Administrative Overheads, out of the ₹ 2,87,500 of Selling and Administrative Overheads.

It is found that the 'Premium' Juicer is produced in smaller batches (250 units per batch) than that of 'Deluxe' Juicer (500 units per batch). Similarly, it takes 10 sales visits to sell 1,000 units of the 'Deluxe' Juicer, while it takes 25 visits to sell 1,000 units of 'Premium' Juicer.

Required:

(i) Prepare a Profitability Statement based on the proposed sales mix, using the most appropriate basis of allocating Fixed Overheads. (In absence of an appropriate basis, do not allocate Overheads to Products).

(ii) Advise the Company on whether it should go ahead with the propose change in sale mix.

Solution:

1. Basic Computations

Particulars	'Deluxe' Juicer	'Premium' Juicer
Revised Sales Mix (1,00,000 in the ratio 16:4)	80,000	20,000
Selling Price per unit	$\frac{63,00,000}{90,000} = 70$	$\frac{9,00,000}{10,000} = 90$
Material Cost per unit	$\frac{10,80,000}{90,000} = 12$	$\frac{2,50,000}{10,000} = 25$
Labour Cost per unit	$\frac{14,40,000}{90,000} = 16$	$\frac{1,60,000}{10,000} = 16$
Number of Batches required at revised sales mix **(Note)**	$\frac{80,000}{500} = 160$	$\frac{20,000}{250} = 80$
Number of sales visits required at revised sales mix **(Note)**	$\frac{80,000}{1000} \times 10 = 800$ visits	$\frac{20,000}{1000} \times 25 = 500$ visits

2. Profit Statement

Particulars	'Deluxe' 80,000 units	'Premium' 20,000 units	Total
(a) Revenue	80,000 × 70= 56,00,000	20,000 × 90 = 18,00,000	74,00,000
(b) Direct Costs – Material	80,000 × 12 = 9,60,000	20,000 × 25 = 5,00,000	14,60,000
– Labour	80,000 × 16 = 12,80,000	20,000 × 16 = 3,20,000	16,00,000
Sub–Total	22,40,000	8,20,000	30,60,000
(c) **Contribution (a) – (b)**	**33,60,000**	**9,80,000**	**43,40,000**
(d) Production OH – Batch related (16 : 8)	7,33,333	3,66,667	11,00,000
(e) Selling and Distribution Overheads (2,87,500 – 1,15,000) in (8 : 5) (Sales Visits ratio)	1,06,154	66,346	1,72,500
(f) **Profit before common OH adjt.**	25,20,513	5,46,987	30,67,500
(g) Unallocated POH & AOH **(Note)**			28,15,000
(h) **Profit**			**2,52,500**

Note: Unallocated POH = ₹ 38,00,000 – ₹ 11,00,000 = ₹ 27,00,000 + Unallocated AOH = 1,15,000

Since, the Company's Profit increases by ₹ 70,000, the proposed change in Sales Mix may be adopted.

2(a): Transfer Pricing – Optimal Decision for Overall Company N 12 (11 Marks)

PEX is a Manufacturing Company of which division PQR manufactures a single standardized product. Some of the output is sold externally, whilst the remainder is transferred to Division RPQ where it is a sub–assembly in the manufacture of that division's product. PQR has the capacity (annual) to produce 30,000 units of the product. The unit costs of division PQR's product are as under –

Particulars	₹
Direct Material	40
Direct Labour	20
Direct Expenses	20
Variable Manufacturing Overheads	20
Fixed Manufacturing Overheads	40
Selling and Packaging Expenses – Variable	10
Total	150

Annually 20,000 units of the product are sold externally at the Standard Price of ₹ 300 per unit.

In addition to the external sales, 10,000 units are transferred annually to division RPQ at an Transfer Price of ₹ 290 per unit. This Transfer Price is obtained by deducting Variable Selling and Packing Expenses from the External Price, since those expenses are not incurred for internal transfers.

Division RPQ incorporates the transferred–in goods into a more advanced product. The unit costs of this product are as follows –

Particulars	₹
Transferred–in–item (from Division PQR)	290
Direct Material and Components	230
Direct Labour	30
Variable Overheads	120
Fixed Overheads	120
Selling and Packing Expenses – Variable	10
Total	800

Division RPQ's Manager disagrees with the basis used to set the Transfer Price. He argues that the transfers should be made at Variable Cost plus an agreed (minimal) mark up because his division is taking output that division PQR would be unable to sell at the price of ₹ 300.

Partly because of this disagreement, a study of the relationship between Selling Price and Demand has recently been carried out for each division by the Company's Sales Director. The study has brought out the following demand schedule –

Division PQR	Selling Price (₹)	200	300	400
	Demand (units)	30,000	20,000	10,000
Division RPQ	Selling Price (₹)	800	900	1,000
	Demand (units)	14,400	10,000	5,600

The Manager of Division RPQ claims that this study supports his case. He suggests that a Transfer Price of ₹ 120 would give Division PQR a reasonable contribution to its Fixed Overheads while allowing Division RPQ to earn a reasonable profit. He also believes that it would lead to an increase of output and an improvement in the overall level of Company Profits.

Required:
(i) Calculate the effect of Transfer Price of ₹ 290 p.u. on Company's Operating Profit. Calculate the Optimal Product mix.
(ii) Advise the Company on whether the Transfer Price should be revised to ₹ 120 per unit.

Solution: **1. PQR's Contribution from External Sales at various quantity levels**

Quantity	Selling Price p.u.	Variable Costs p.u.	Contribution per unit	Total Contribution
10,000	₹ 400	₹ 110	₹ 290	₹ 29,00,000
20,000	₹ 300	₹ 110	₹ 190	**₹ 38,00,000** (max)
30,000	₹ 200	₹ 110	₹ 90	₹ 27,00,000

Observation: PQR's Contribution from External Sales are maximized at ₹ 38,00,000 when sale quantity is 20,000 units. Hence, its present decision to sell 20,000 units externally is correct.

Note: Variable Costs of PQR are –
- For External Sales: Materials + Labour + Direct Exps. + Var.OH = 40 + 20 + 20 + 20 + 10 = **₹ 110 per unit.**
- For Internal Transfers: ₹ 110 – ₹ 10 (S & D OH are not incurred for Internal Transfers) = **₹ 100 per unit.**

2. Determination of Internal Transfer quantity, i.e. Demand by RPQ Division from PQR Division

When TP = ₹ 290 p.u. (Present TP)						When TP = ₹ 120 p.u. (Proposed TP)					
Qty	SP p.u	Own VC	TP p.u	Cn p.u	Total Cn (₹)	Qty	SP p.u	Own VC	TP p.u	Cn p.u	Total Cn (₹)
5,600	1,000	390	290	320	17,92,000	5,600	1,000	390	120	490	27,44,000
10,000	900	390	290	220	**22,00,000** (maximum)	10,000	900	390	120	390	39,00,000
14,400	800	390	290	120	17,28,000	14,400	800	390	120	290	41,76,000 (maximum)
So, Demanded Internal Transfer Qty= **10,000 units**						So, Demanded Internal Transfer Qty = **14,400 units**					

Note: RPQ's Own Variable Costs per unit = Materials + Labour + Direct Exps. + Var.OH = 230 + 30 + 120 + 10 = **₹ 390**
It is assumed that both Departments have enough capacity to meet internal & external demands.

3. Determination of Optimal Product Mix (from Company's Perspective)

Option I	**Computation of Contribution from Co.'s Viewpoint**	**₹**
PQR: External Sales 20,000 + Tfr 5,600	20,000 × 190	38,00,000
RPQ: External Sales 5,600	5,600 × (1,000 – 390 –100)	28,56,000
	Total	**66,56,000**
Option II		
PQR: External Sales 20,000 + tfr 10,000	20,000 × 190	38,00,000
RPQ: External Sales 10,000	10,000 × (900 – 390 –100)	41,00,000
	Total	**(Max) 79,00,000**
Option III		
PQR: External Sales 15,600 + tfr 14,400	15,600 × 190	29,64,000
RPQ: External Sales 14,400	14,400 × (800 – 390 –100)	44,64,000
	Total	**74,28,000**

Note: Since the Company's Profit is maximum at Option II, its present Product Mix is Optimal.

4. Profit Statement at various Transfer Prices for Optimum Output level

Particulars	**Transfer at TP = ₹ 290 p.u.**			**Transfer at TP = ₹ 120 p.u.**		
	PQR		**RPQ**	**PQR**		**RPQ**
	Sale	**Transfer**	**Sale**	**Sale**	**Transfer**	**Sale**
(a) Qtty (units)	20,000	10,000	10,000	20,000	10,000	10,000
(b) Sale Price pu	₹ 300	₹ 290	₹ 900	₹ 300	₹ 120	₹ 900
(c) VC pu: Own	₹ 110	₹ 100	₹ 390	₹ 110	₹ 100	₹ 390
Transfer in	–	–	₹ 290	–	–	₹ 120
Total VC pu	₹ 110	₹ 100	₹ 680	₹ 110	₹ 100	₹ 510
(d) Contribution pu	**₹ 190**	**₹ 190**	**₹ 220**	**₹ 190**	**₹ 20**	**₹ 390**
(e) Total Contribution (a × d)	₹ 38,00,000	₹ 19,00,000	₹ 22,00,000	₹ 38,00,000	₹ 2,00,000	₹ 39,00,000
	₹ 57,00,000		**₹ 22,00,000**	**₹ 40,00,000**		**₹ 39,00,000**
(f) Fixed Cost **(Note)**	12,00,000		12,00,000	12,00,000		12,00,000
(g) Profit	**45,00,000**		**10,00,000**	**28,00,000**		**27,00,000**
(h) Company Profit	(45,00,000 + 10,00,000)= **₹ 55,00,000**			(28,00,000 + 27,00,000) = **₹ 55,00,000**		

Note: Fixed Cost: **PQR:** 30,000 units × ₹ 40 = 12,00,000 **RPQ:** 10,000 units × ₹120 = 12,00,000

5. Evaluation of the Proposed Transfer Price of ₹ 120 per unit

- Under the Proposed TP of ₹ 120, PQR Division earns lower Contribution / Profit (i.e. ₹ 40,00,000 when compared to ₹ 57,00,000 at present) and may not be ready to accept the proposal.
- However, it is not worthwhile for PQR to sell more than 20,000 units in external market **(Refer WN 1).** Hence any price above Relevant Variable Cost + Reasonable Margin, if available should be acceptable for PQR.

2(b): Transportation N 12 (5 Marks)

Explain the term 'Degeneracy' in the context of a Transportation Problem. How can this be solved?

Solution: **Refer Page 17.4, Q.No.9, Point 3 [M 85, N 09, M 10]**

3(a): Standard Costing – Cost Variances N 12 (9 Marks)

Sunglow Limited manufactures and sells a single product. From the records of the Company the following information is available for November 2012. The Standard Cost comprises the following –

Particulars		Unit	₹
Direct Material	– X	8	320
	– Y	24	1,680
	– Z	16	400
			2,400

Particulars	Unit	₹
Direct Wages (₹ 40 per hour)		1,600
Variable Overhead (25% of Direct Wages)		400
Fixed Overhead (based on budgeted production of 10,000 units of the Final Product per month)		600
Total		5,000

The Budgeted Selling Price is ₹ 700 each and the Budgeted Sales for the month were 14,000 units.

The following were the transactions for the month:

Direct Material	Units	Purchase Price per unit	Issued Units
X	44,000	42	82,400
Y	1,40,000	71	2,46,000
Z	60,000	24	1,64,000

Direct Wages: ₹ 90,00,000 (3,98,000 hours)
Overheads: Variable ₹ 2,00,000, Fixed ₹ 3,00,000.
Production: 11,000 Units
Sales: 9,000 units at ₹ 700 each and 3,500 units at ₹ 750 each.

Required:
Calculate (i) Material Price Variance; (ii) Material Mix Variance; (iii) Labour Rate Variance (iv) Labour Efficiency Variance (v) Variable Overhead Efficiency Variance; and (vi) Fixed Overhead Efficiency Variance.

Solution:

Note: The computations given below are based on the data available in the Question. However, the data needs to be modified in view of the fact that Selling Price of ₹ 700 p.u. is not commensurate with Standard Cost of ₹ 5,000 p.u.

1. Computation of Actual Cost of Materials Consumed

Issued Units	Purchased Units	Balance Consumed out of Opg Stock	Std Price p.u. (₹)	Opg Stock at Standard Cost	Current Purchase at Current Cost	Total Cost of Consumption
82,400	44,000	38,400 units	$\frac{320}{8} = 40$	38,400 × 40 = ₹ 15,36,000	44,000 × 42 = ₹ 18,48,000	₹ 33,84,000
2,46,400	1,40,000	1,06,400 units	$\frac{1,680}{24} = 70$	1,06,400 × 70 = ₹ 74,48,000	1,40,000 × 71 = ₹ 99,40,000	₹ 1,73,88,000
1,64,000	60,000	1,04,000 units	$\frac{400}{16} = 25$	1,04,000 × 25 = ₹ 26,00,000	60,000 × 24 = ₹ 14,40,000	₹ 40,40,000

Note: It is assumed that the Company follows Single Plan and Opening Inventory is valued at Standard Cost.

2. Computation of Standard Quantity (SQ)

Actual Output (Given) = 11,000 units

Material	X	Y	Z
Standard Reqd	8	24	16
Std Qtty	88,000 uts	2,64,000 uts	1,76,000 uts

3. Computation of Revised Actual Quantity (RAQ)

Total AQ Consumed = 82,400 + 2,46,400 + 1,64,000 = 4,92,800 units

Material	X	Y	Z
Standard Mix	8	24	16
RAQ	82,133	2,46,400	1,64,267

4. Material Variance Computation Chart

Material	Col. (1): SQ× SP	Col. (2): RAQ × SP	Col. (3): AQ× SP	Col. (4): AQ × AP
X	88,000 × ₹ 40 = 35,20,000	82,133 × ₹ 40 = 32,85,320	82,400 × ₹ 40 = 32,96,000	**(WN 1)** ₹ 33,84,000
Y	2,64,000 × ₹ 70 = 1,84,80,000	2,46,400 × ₹ 70 = 1,72,48,000	2,46,400 × ₹ 70 = 1,72,48,000	**(WN 1)** ₹ 1,73,88,000
Z	1,76,000 × ₹ 25 = 44,00,000	1,64,267 × ₹ 25 = 41,06,675	1,64,000 × ₹ 25 = 41,00,000	**(WN 1)** ₹ 40,40,000
Total	**₹ 2,64,00,000**	**₹ 2,46,39,995**	**₹ 2,46,44,000**	**₹ 2,48,12,000**

Material **Mix** Variance = ₹ 2,46,39,995 – ₹ 2,46,44,000 = **₹ 4,005 A**

Material **Price** Variance = ₹ 2,46,44,000 – ₹ 2,48,12,000 = **₹ 1,68,000 A**

Material–wise Breakup of Variances

Particulars	X	Y	Z	Total
Material Mix Variance	10,680 A	0	6,675 A	4,005 A
Material Price Variance	88,000 A	1,40,000 A	60,000 F	1,68,000 A

5. Labour Variance Computation Chart

Col. (1): SH× SR	Col. (2): AH× SR	Col. (3): AH × AR
$(11{,}000 \times \frac{1{,}600}{400}) \times$ ₹ 40 = ₹ **1,76,00,000**	3,98,000 × ₹ 40 = **₹ 1,59,20,000**	3,98,000 × ₹ **22.61** = **₹ 90,00,000**

Labour **Efficiency** Variance = ₹ 1,76,00,000 – ₹ 1,59,20,000 = ₹ 16,80,000 F

Labour **Rate** Variance = ₹ 1,59,20,000 – ₹ 90,00,000 = ₹ 69,20,000 F

6. Variable Overhead Efficiency Variance **= AO × SR pu – AH × SR ph**

= (11,000 units × ₹ 400 p.u.) **–** [3,98,000 hours × (₹ 40 × 25%)]

= ₹ 44,00,000 – ₹ 39,80,000 = **₹ 4,20,000 F**

7. Fixed Overhead Efficiency Variance **= AO× SR – AH× SR**

= (11,000 units × ₹ 600 p.u.) – (3,98,000 hours × ₹ 15 ph **(Note 1)**)

= ₹ 66,00,000 – ₹ 59,70,000 = **₹ 6,30,000 F**

Notes:

1. Labour Cost ₹ 1,600 p.u. at ₹ 40 p.h. So, 1 unit requires = $\frac{1{,}600}{40}$ = ₹ 40 hours.
2. Hence, SR p.h. of FOH = $\frac{₹\ 600\ \text{p.u.}}{40\ \text{hrs p.u.}}$ = ₹ 15 p.h.

3(b): Simulation – Service Rate Simulation in Travel Agency N 12 (7 Marks)

An International Tourist Company deals with numerous Personal Callers each day and prides itself on its level of service. The time to deal with each Caller depends on the Client's requirements which range from, say, a request for a brochure to booking a round–the–world cruise. If a client has to wait for more than 10 minutes for attention, it is the Company's Policy for the Manager to see him personally and to give him a Holiday Voucher worth ₹ 15.

The Company's observations have shown that the time taken to deal with Clients and the arrival pattern of their calls follow the following distribution pattern:

Time to deal with Clients	Minutes	2	4	6	10	14	20	30
	Probability	0.05	0.10	0.15	0.30	0.25	0.10	0.05

Time between call arrivals	Minutes	1	8	15	25
	Probability	0.2	0.4	0.3	0.1

Required:

(i) Describe how you would simulate the operation of the Travel Agency based on the use of Random Number Tables.

(ii) Simulate the arrival and serving of 12 Clients, and show the number of Clients who receive a Voucher (use Line 1 of the Random Numbers below to derive the arrival pattern and Line 2 for serving times); and

(iii) Calculate the weekly cost of vouchers, assuming the proportion of Clients receiving vouchers derived from (ii) applies throughout a week of 75 operating hours.

Random Numbers

Line 1	03	47	43	73	86	36	96	47	36	61	46	98
Line 2	63	71	62	33	26	16	80	45	60	11	14	10

Solution: Procedure to simulate the operation of the travel agency based on use of random numbers:

- List the times for arrival and service, i.e. variables, and their respective probabilities of occurrence. Compute Cumulative Probability for each event.

- Compute Random Number Range Intervals based on given Probability and Cumulative Probability.
- Assign corresponding Time Values to each Client using Random Number Table by locating in which range each Random Number falls in.

1. Random Number Allocation Tables

Table 1A: Time to deal with Clients

Minutes	Prob.	Cum Prob.	Random Nos.
2	0.05	0.05	00 – 04
4	0.10	0.15	05 – 14
6	0.15	0.30	15 – 29
10	0.30	0.60	30 – 59
14	0.25	0.85	60 – 84
20	0.10	0.95	85 – 94
30	0.05	1.00	95 – 99

Table 1B: Time between Arrivals

Minutes	Prob.	Cum Prob.	Random Nos.
1	0.20	0.20	00 – 19
8	0.40	0.60	20 – 59
15	0.30	0.90	60 – 89
25	0.10	1.00	60 – 99

2 Simulation Table (Note: Time in Minutes**)**

Client	Arrival Pattern R.No.	Time bet'n Arrivals (1B)	Arrival Time	Service Start Time	Service R.No.	Service Time (1A)	Service End Time	Waiting Time
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
1	03	1	1	1	63	14	15	–
2	47	8	9	15	71	14	29	15 – 9 = 6
3	43	8	17	29	62	14	43	29 – 17 =12
4	73	15	32	43	33	10	53	43 – 32 =11
5	86	15	47	53	26	6	59	53 – 47 = 6
6	36	8	55	59	16	6	65	59 – 55 = 4
7	96	25	80	80	80	14	94	–
8	47	8	88	94	45	10	104	94 – 88 = 6
9	36	8	96	104	60	14	118	104 – 96 = 8
10	61	15	111	118	11	4	122	118 – 111= 7
11	46	8	119	122	14	4	126	122–119 = 3
12	98	25	144	144	10	4	148	–

Conclusion: 2 Clients, (viz. Client 3 and Client 4) will receive Holiday Vouchers as waiting time is greater than 10 minutes.

Total Service Time = 148 mins, of which Holiday Voucher is given for 2 Clients.

So, for 75 hours, i.e. 75 × 60 = 4,500 minutes, Number of Clients to receive Vouchers = $\frac{4,500}{148} \times 2$ = 61 Clients.

So, Weekly Voucher Cost = 61 Clients × ₹ 15 = **₹ 915.**

4(a): Assignment N 12 (8 Marks)

A Production Supervisor is considering how he should assign five jobs that are to be performed to five Operators. He wants to assign the jobs to the Operators in such a manner that the aggregate costs to perform the job is the least. He has the following information about the wages paid to the Operators for performing these jobs –

Operators	Jobs				
	1	2	3	4	5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

Required: Assign the Jobs to the Operators so that the aggregate cost is the least.

Solution:

I. Given Matrix

10	3	3	2	8
9	7	8	2	7
7	5	6	2	4
3	5	8	2	4
9	10	9	6	10

II. Row Operations

8	1	1	0	6
7	5	6	0	5
5	3	4	0	2
1	3	6	0	2
3	4	3	0	4

III. Column Operations

7	0	0	0	4
6	4	5	0	3
4	2	3	0	0
0	2	5	0	0
2	3	2	0	2

Lines = 4, Order = 5, LOE = 2
No. of Lines ≠ Order

IV. Subtracting from LOE we have,

9	0	0	2	6
6	2	3	0	3
4	0	1	0	0
0	0	3	0	0
2	1	0	0	2

V. Optimal Assignment

9	[0]	~~0~~	2	6
6	2	3	[0]	3
4	~~0~~	1	~~0~~	[0]
[0]	~~0~~	3	~~0~~	~~0~~
2	1	[0]	~~0~~	2

VI. Answer

Operator	Cost
A	3
B	2
C	4
D	3
E	9
Total Cost	**21**

4: Theory – Various Topics (2 × 4 = 8 Marks)

Question	**Reference**
(b) Discuss the characteristics of Zero Base Budgeting.	**Page 7.5, Q.No.14, M 93, N 94, N 05**
(c) Discuss the essential requisites for installation of Uniform Costing System.	**Page 15.1, Q.No.3, RTP, N 08, M 10**

5(a): Pricing – Capital Budgeting N 12 (12 Marks)

The Board of Directors of XY Company Limited are considering a new type of Handy Sewing Machine which their R & D Department has developed. The expenditure so far on Research has been ₹ 95,000 and a Consultant's Report has been prepared at a cost of ₹ 22,500. The report provides the following information –

Particulars		₹
Cost of Production p.u.	– Material	45.00
	– Labour	75.00
	– Fixed Overheads (Based on Company's normal allocation rates)	20.00
Total		140.00

Anticipated additional Fixed Costs: Rent for additional space ₹ 1,25,000 per annum.
Other additional Fixed Costs ₹ 70,000 per annum.

A new Machine will be built with the facilities with a cost of ₹ 1,10,000 (Material ₹ 90,000 and Labour ₹ 20,000). The Materials are readily available in Stores which are regularly used. However, these are to be replenished immediately. The price of these Materials have since been increased by 50%. Scrap Value of the Machine at the end of the 10th year is estimated at ₹ 20,000. The Product Scraps generated can be disposed off at the end of Year 10 for a price of ₹ 1,43,000.

Years 1 – 5		Years 6 – 10	
Demand (Units)	Probability	Demand (Units)	Probability
40,000	0.15	24,000	0.30
20,000	0.60	16,000	0.50
12,000	0.25	4,000	0.20

It is estimated that the commercial life of the Machine will be no longer than 10 years and the after tax cost of capital is 10%. The full cost of the Machine will be depreciated on straight line basis, which is allowed for computing the Taxable Income, over a period of 10 years. Tax rate is 30%.

DCF Factors at 10%: 1 – 5 years (cumulative) 3.79, 6 – 10 years (cumulative) 2.355, 10th year 0.386

Required: Compute Minimum Selling Price for the Handy Sewing Machine.

Solution: Alternative 1 – Using Relevant Costs Approach for Capital Investment

1. Basic Computations

(a) **Initial Investment** = Relevant Cost of Machine = (90,000 × 150% = 1,35,000) + Labour 20,000 = **₹ 1,55,000**

(b) **Effective Depreciation** = $\frac{\text{Cost of Machine } 1{,}55{,}000 - \text{Scrap Value } 20{,}000}{10 \text{ years}}$ = **₹ 13,500**

(Assumed that Asset will be Capitalised at Relevant Cost and Depreciation on that Cost is allowable).

(c) **Effective Demand:** For Years 1 – 5 = (40,000 units × 0.15) + (20,000 units × 0.60) + (12,000 units × 0.25) = 21,000.
For Years 6 – 10 = (24,000 units × 0.30) + (16,000 units × 0.50) + (4,000 un its × 0.20) = 16,000.
(It is assumed that demand quantities are on per annum basis, for each year.)

(d) **Computation of Cash Flows after Tax (CFAT)**

Particulars	Years 1 – 5	Years 6 – 10
Sales Volume per annum	21,000	16,000
Sales (Let Selling Price be P)	21,000 P	16,000 P
Less: Material	21,000 × ₹ 45 = 9,45,000	16,000 × ₹ 45 = 7,20,000
Less: Labour	21,000 × ₹ 75 = 15,75,000	16,000 × ₹ 75 = 12,00,000
Less: Incremental FOH	1,95,000	1,95,000
Less: Depreciation **(Note 1(b))**	13,500	13,500
Profit Before Tax	21,000 P – 27,28,500	16,000 P – 21,28,500
Less: Tax at 30%	6,300 P – 8,18,550	4,800 P – 6,38,550
Profit After Tax	**14,700 P – 19,09,950**	**11,200 P – 14,89,950**
Add: Depreciation	13,500	13,500
Cash Flows After Tax	**14,700 P – 18,96,450**	**11,200 P – 14,76,450**

Note:
1. R & D Expenses ₹ 92,000 and Consultant's Report ₹ 22,500 are already incurred (historical/sunk) and hence irrelevant.
2. Apportioned Fixed Overheads ₹ 20 p.u. is not relevant.

2. Discounting

Years	Cash Flow		DCF at 10%	Discounted Cash Flow
0	Initial Investment	= 1,55,000	0	(1,55,000)
1 – 5	CFAT p.a.	= 14,700 P – 18,96,450	3.79	55,713 P – 71,87,546
6 – 10	CFAT p.a.	= 11,200 P – 14,76,450	2.355	26,376 P – 34,77,040
10	Salvage Value of Asset	= 20,000	0.386	7,720
10	Post Tax Scrap Income	= 1,43,000 × (100% – 30%) = 1,00,100	0.386	38,639
				82,089 P – 1,07,73,227

To obtain Minimum Selling Price, 82,089P – 1,07,73,227 = 0 On solving, P = $\frac{1{,}07{,}73{,}227}{82{,}089}$ = **₹ 131.24**

Alternative 2: Recovery of all Long Run Normal Costs are considered for both Initial Invt & Annual Fixed OH.

1. Basic Computations

(a) **Initial Investment:**

Particulars	₹
(i) Relevant Cost of Machine = (90,000 × 150% = 1,35,000) + Labour 20,000	1,55,000
(ii) Research and Development Expenditure	95,000
(iii) Consultants' Report	22,500
Total	**2,72,500**

(b) **Effective Depreciation & Amortisation:**

Depreciation = $\frac{\text{Cost of Machine } 1{,}55{,}000 - \text{Scrap Value } 20{,}000}{10 \text{ years}}$ = 13,500.

Amortisation (R & D and Consultants' Report Cost) = $\frac{1{,}17{,}500}{10 \text{ years}}$ = 11,750.

(c) **Effective Demand:** As above

(d) **Computation of Cash Flows after Tax:**

Particulars	Years 1 – 5	Years 6 – 10
Sales Volume per annum	21,000	16,000
Sales	21,000 P	16,000 P
Less: Material	21,000 × ₹ 45 = 9,45,000	16,000 × ₹ 45 = 7,20,000
Less: Labour	21,000 × ₹ 75 = 15,75,000	16,000 × ₹ 75 = 12,00,000
Less: Normal FOH	21,000 × ₹ 20 = 4,20,000	16,000 × ₹ 20 = 3,20,000
Less: Incremental FOH **(Note)**	1,95,000	1,95,000
Less: Depreciation & Amortisation	25,250	25,250
Profit Before Tax	21,000 P – 31,60,250	16,000 P – 24,60,250
Less: Tax at 30%	6,300 P – 9,48,075	4,800 P – 7,38,075
Profit After Tax	**14,700 P – 22,12,175**	**11,200 P – 17,22,175**
Add: Depreciation	25,250	25,250
Cash Flows After Tax	**14,700 P – 21,86,925**	**11,200 P – 16,96,925**

Note: It is assumed that the Normal FOH of ₹ 20 p.u. and Incremental FOH of ₹ 1,95,000 will be incurred in long run and identifiable with this product using normal allocation rates.

2. Discounting

Years	Cash Flow		DCF at 10%	Discounted Cash Flow
0	Initial Investment	= 2,72,500	0	(2,72,500)
1 – 5	CFAT p.a.	= 14,700 P – 21,86,925	3.79	55,713 P – 82,88,446
6 – 10	CFAT p.a.	= 11,200 P – 16,96,925	2.355	26,376 P – 39,96,258
10	Salvage Value of Asset	= 20,000	0.386	7,720
10	Post Tax Scrap Income	= 1,43,000 × (100% – 30%) = 1,00,100	0.386	38,639
				82,089 P – 1,25,10,845

To obtain Minimum Selling Price, 82,089P – 1,25,10,845 = 0 On solving, P = $\frac{1,25,10,845}{82,089}$ = **₹ 152.40**

5(b): Learning Curve N 12 (4 Marks)

What are the distinctive features of Learning Curve Theory in manufacturing environment? Explain the Learning Curve Ratio.

Solution: **Refer Page 20.1, Q.No.3, [N 10] and Page 20.2, Q.No.7**

6(a): Costing of Service Sector N 12 (7 Marks)

XY Hotel has 40 bed rooms with a maximum occupancy of 490 sleeper nights per week. Average Occupancy is 60% throughout the year. Meals provided to Guests have been costed and the average food cost per person per day is as follows:

Particulars	₹
Breakfast	72.00
Lunch	220.00
Dinner	268.00
	560.00

Direct Wages and Staff meals per week are as under:

Particulars	₹
Housekeeping	39,040.00
Restaurant	68,600.00
General	35,200.00

Direct Expenses per annum are ₹ 9,15,200 for Housekeeping and ₹ 10,40,000 for Restaurant. Indirect Expenses amount to ₹ 68,22,400, which should be apportioned on the basis of floor area. The floor areas are as follows:

Particulars	Sq. Mt.
Bed Rooms	3,600
Restaurant	1,200
Service Area	600

A Net Profit of 10% must be made on the Restaurant Taking and also on Accommodation Takings.

Required: Calculate what inclusive term per person should be charged per day and also show the split between meals and Accommodation Charges.

Solution: **Statement of Operating Costs and Revenue Per Week**

Particulars	Total	House Keeping	Restaurant and Kitchen	General
Direct Wages & Staff Meals (given)	1,42,840	39,040	68,600	35,200
Direct Expenses (Cost ÷ 52 weeks)	37,600	17,600	20,000	–
Indirect Expenses= $\frac{68,22,400}{52}$ (in 6:2:1)	1,31,200	87,466	29,156	14,578
Total of the above	3,11,640	1,44,106	1,17,756	49,778
General & Service re–apportioned in Cost ratio (1,44,106:1,17,756)	–	27,393	22,385	(49,778)
Total Costs per week	3,11,640	1,71,499	1,40,141	–
Cost Unit, i.e. 60% of 490 Sleeper–Nights	294	294	294	–
Fixed Cost per person per day	1060	583	477	–
Food Cost given (72+220+268)	560	–	560	–
Total Costs	1620	583	1037	–
Add: Profit at $1/10^{th}$ on Takings=$1/9^{th}$ on Cost	180	64.77	115.22	–
Desired Takings / Charges per person	**1,800**	**647.78**	**1,152.22**	**–**

6: Theory – Various Topics

Question	Reference
(b) In the context of Activity Based Costing System, explain the following statement: "Statement Cost Analysis should exploit Internal Linkages." (4 Marks)	**Page 8.7, Q.No.14. Also refer Page 14.3, Q.No.7 & 8**
(c) Write a short note on the distinction between PERT and CPM. (5 Marks)	**Page 19.7, Q.No.19, RTP, N 87, N 98, N 00**

7: Theory – Varoius Topics – any 4 out of 5 (4 × 4 Marks = 16 Marks)

Question	Reference
(a) What is Target Costing? It is said that Target Costing fosters team work within the organization. Explain how Target Costing creates an environment in which team work fosters.	**Page 9.1, Q.No.1**
(b) What qualitative factors should be considered in a decision to outsource manufacturing of a product?	**Page 2.18, Q.No.52, N 90, N 94, N 01, M 01**
(c) "Sunk Cost is irrelevant in decision making, but all Irrelevant Costs are not Sunk Costs." Explain with examples.	**Page 4.3, Q.No.8, M 01, M 06, N 09**
(d) Write a short note on the characteristics of the Dual Problem.	**Page 18.4, Q.No.12, M 87, N 96**
(e) Brief the principles associated with Synchronous Manufacturing.	**Page 13.10, Q.No.26, M 10**