

Section – II

3. Use simplex or graphical method of linear programming and find optimal solution. (10)

$$\text{Max. } Z = 2X_1 + 7X_2$$

Subject to Constraints:

$$4X_1 + 10X_2 \leq 80$$

$$6X_1 \leq 36$$

$$X_1, X_2 \geq 0 \text{ (Non-negativity)}$$

4. A company solicits bids on each of the four projects from five contractors. Only one project may be assigned to any contractor. The bids received (in thousands of rupees) are given in the accompanying table. Contractor D feels unable to carry out project 3 and therefore, submits no bid.

Jobs	Contractor				
	A	B	C	D	E
1	20	27	24	26	25
2	18	29	26	27	24
3	30	33	32	—	31
4	28	30	29	28	21

- a) Use the Hungarian method to find the set of assignment. (8)

- b) What is the minimum total achievable cost? (2)

5. The data for a PERT network is given in the following table :

Activity node (i – j)	Time duration (days)		
	Optimistic Time	Most Likely Time	Pessimistic Time
1 – 2	3	5	7
1 – 3	5	5	5
1 – 4	6	12	18
2 – 3	2	5	8
2 – 5	11	14	17
3 – 4	15	24	33
3 – 6	3	6	9
4 – 6	9	45	21
5 – 6	4	10	16

- a) Draw a network, and estimate the expected duration of the project and corresponding variance. (6)

- b) What is the probability that the project will be completed between 48 to 58 days? (2)

- c) What is the probability of completing the project within 34 days? (2)

Duration: 2 Hrs.

60 Marks.

- Note :**
1. Section I is compulsory.
 2. Answer any three questions from Section II.
 3. Answers of both sections may be written in the same answer book.
 4. Graph papers will be supplied on request.
 5. Figures on the R.H.S. indicated marks.
 6. Use of non-programmable calculator is allowed and mobile phone is not allowed.
 7. Normal distribution table is attached on the last page for use if required.
 8. Support your answers with diagrams / illustrations, wherever necessary.

Section - I**1. Answer the following questions briefly:**

- a) What is E.M.V? Give steps for calculating E.M.V. (3)
- b) Explain the difference between free, interfering and independent float. (3)
- c) Why is a non-degenerate solution a prerequisite for optimality test of a transportation solution? (3)
- d) Why an optimal solution to an unbounded maximization LPP cannot be found in simplex method? (3)
- e) What is the difference between slack, surplus and artificial variables? (3)

2. Consider the following transportation problems involving minimization of cost (in 1000 rupees) :

Sources	Distribution Centre				Supply
	D1	D2	D3	D4	
S1	14	8	22	27	300
S2	8	13	17	14	400
S3	11	17	19	9	500
Demand	250	200	350	400	

- a) Find the Initial Feasible Solution (IFS) by North West Corner Method to the above transportation problem. (3)
- b) Test the IFS for optimality and if required improve it to optimality and calculate minimum total transportation cost. (7)
- c) Make analysis of the optimal solution obtained by you and answer the following questions:
 - i) Is the optimal solution unique? If there is any alternate optimal solution, identify it. (2)
 - ii) The transporter is willing to provide a discount of 50 percent on the freight on the route S1D3, should the offer be accepted? (2)
 - iii) What is the importance of Multiple optimal / alternate optimal solution? (1)

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- 6.a) A consumer goods company has set up following pay-off table for the sales returns of their product. Three strategies (S_1 , S_2 , S_3) are identified to deal with three uncertain nature (N_1 , N_2 , N_3).

	S_1	S_2	S_3
N_1	800	500	300
N_2	350	300	100
N_3	400	550	0

You are required to identify right strategy under following criteria :

- Maximin
- Maximax
- Minimax regret.

(1)

(1)

(3)

- b) A toy manufacturing company is bringing out a new type of toy. The company is attempting to decide whether to bring out a full, partial or minimal product line. The company has three levels of product acceptance and has estimated profit from the first year of production. The relevant data are shown in the following table :

(5)

Product acceptance	Probability	Product line		
		Full	Partial	Minimal
Good	0.20	80	70	50
Fair	0.30	50	45	40
Poor	0.50	15	10	0

Construct decision tree and suggest the best alternative for the company.

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