

15/14/2023
30
15/12

Sr. No. 009704

December 2023

B.Tech (EIC) Re-Appear 7th SEMESTER
Operational Research (OE-703)

Max. Marks:75

Time: 3 Hours

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
 2. Answer any four questions from Part -B in detail.
 3. Different sub-parts of a question are to be attempted adjacent to each other.

PART -A

- Q1 (a) Define optimal feasible solution and unbounded solution of an LPP. (1.5)
(b) Discuss the effect of addition of a constraint in sensitivity analysis. (1.5)
(c) Explain the degeneracy in linear programming problem. (1.5)
(d) Explain the basic logic of arrow network. (1.5)
(e) Define the term critical activity. (1.5)
(f) Write the major limitations of PERT model. (1.5)
(g) Write the general form of integer linear programming. (1.5)
(h) State Bellman's principle of optimality of dynamic programming. (1.5)
(i) What are the essential characteristics of dynamic programming? (1.5)
(j) Write the different type of float. (1.5)

PART -B

- Q2 (a) Solve the following LPP by simplex method: (10)

$$\text{Max. } Z = 3x_1 + 5x_2 + 4x_3$$

Subject to the constraints

$$2x_1 + 3x_2 \leq 8, \quad 2x_2 + 5x_3 \leq 10, \quad 3x_1 + 2x_2 + 4x_3 \leq 15$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

- (b) Find the dual of the following LPP: (5)

$$\text{Min. } Z = x_1 - 3x_2 - 2x_3$$

Subject to the constraints

$$3x_1 - x_2 + 2x_3 \leq 7, \quad 2x_1 - 4x_2 \geq 12, \quad -4x_1 + 3x_2 + 8x_3 = 10$$

$$\text{and } x_1, x_2 \geq 0, \quad x_3 \text{ is unrestricted.}$$

- Q3 (a) Using dual simplex method, solve the following LPP (10)

$$\text{Max. } Z = -2x_1 - x_3$$

Subject to the constraints

$$x_1 + x_2 - x_3 \geq 5, \quad x_1 - 2x_2 + 4x_3 \geq 8 \text{ and } x_1, x_2, x_3 \geq 0.$$

- (b) Explain the difference between a transportation problem and an assignment problem with examples. (5)

009704
2

Q4 (a) All activities which together constitute a small engineering project are given in the following table. The table also shows the necessary immediate predecessors for each activity. (12)

Activity	A	B	C	D	E	F	G	H	I	J
Immediate predecessors	----	A	A	A	B	C,D	D	B	E,F,G	G
Activity duration	2	3	4	5	6	3	4	7	2	3

- (i) Construct an activity network.
- (ii) The total float for each activity.
- (iii) The critical path

(b) What are the basic differences between PERT and CPM. (3)

Q5 (a) Define critical path, slack time, float time in the context of network model. (10)
Also, discuss various steps used in the application of PERT and CPM.

(b) Write a short note on Integer linear programming. (5)

Q6 (a) Solve the following LPP (10)

$$\text{Max. } Z = 2x_1 + 3x_2$$

Subject to the constraints

$$6x_1 + 5x_2 \leq 25, \quad x_1 + 3x_2 \leq 10 \quad \text{and} \quad x_1, x_2 \geq 0 \quad \text{and are integers.}$$

(b) Write a short note on the relation between linear programming and dynamic programming. (5)

Q7 Use dynamic programming to show that $-\sum_{i=1}^n p_i \log p_i$ is maximum subjected (15)

$$\text{to } \sum_{i=1}^n p_i = 1, \quad \text{when } p_1 = p_2 = p_3 = \dots = p_n = \frac{1}{n}.$$
