B.Tech., IV SEMESTER
Operations Research (CE-212)

Time: 3 Hours   **Max. Marks:60**

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) Discuss in brief what are the scopes of OR (2)

(b) Define a general linear programming problem (2)

(c) Explain the concept of degeneracy in simplex method and how is it resolved. (2)

(d) What is duality theory. (2)

(e) Describe the computational procedure of optimality test in a Transportation problem. (2)

(f) How will you solve an assignment problem, Where a particular assignment is prohibited. (2)

(g) Explain briefly Shortest route problem (2)

(h) Discuss any two queuing models with notations in brief. (2)

(i) Define Total float and Independent float. (2)

(j) Define inventory problem. (2)

PART -B

Q2   Solve the following LPP using Simplex Method (10)

$$Maxz = 3x_1 + 2x_2 + 5x_3, Subject\ to:$$
$$x_1 + 2x_2 + x_3 \leq 430$$
$$3x_1 + 2x_3 \leq 460$$
$$x_1 + 4x_2 \leq 420, \quad x_1, x_2, x_3 \geq 0$$

Q3   Solve the following LPP using Two Phase method: (10)

$$Max\ z = 2x_1 + 3x_2 + 5x_3 \quad subject\ to$$
$$3x_1 + 10x_2 + 5x_3 \leq 15$$
$$x_1 + 2x_2 + x_3 \geq 4, \quad 33x_1 - 10x_2 + 9x_3 \leq 33, \quad x_1, x_2, x_3 \geq 0$$

Q4 (a) Solve the following LPP using dual Simplex method: (5)

$$Minimize\ z = 2x_1 + x_2$$

Subject to:
$$3x_1 + x_2 \geq 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 3$$
$$x_1, x_2 \geq 0$$

(b) Five operators have to be assigned to five machines. The assignment costs are given in the following table:

Machine → Operator ↓	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	3	6
C	10	7	2	2	2
D	5	11	9	7	12
E	7	9	10	4	12

(5)

Assign the operators to different machines so that total cost is minimized.

Q6 (a) Draw the network diagram from the following activities and find critical path and total float of activities . (5)

Activity	Activity Duration (in weeks)	Activity	Activity Duration(in weeks)
(0-1)	5	(3-5)	7
(0-2)	10	(3-6)	11
(1-2)	4	(4-6)	8
(1-3)	8	(4-7)	9
(1-4)	3	(5-7)	9
(2-3)	6	(5-6)	4
(2-5)	8	(6-7)	1

(b) What are the differences between CPM and PERT and also explain the basic steps in PERT/CPM techniques. (5)

Q7 (a) Explain the basic characteristics of an inventory system. (5)

(b) If in a period of 2 hours, in a day (8 to 10am), trains arrive at the yard every 20 minutes but the service time continues to remain 36 minutes but the service time continues to remain 36 minutes, then calculate, for this period: (5)
    (i)The probability that the yard is empty, and
    (ii)The average number of trains in the system, on the assumption that the line capacity of the yard is only to 4 trains.

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