

N.B.:

- 1) Answer ANY THREE questions from Section I. Each question carries 10 Marks
- 2) Answer ANY TWO questions from Section II. Each question carries 15 Marks.
- 3) Answer to both the sections should be written in **SAME** Answer book.
- 4) Draw a labeled diagram WHEREVER necessary
- 5) Graph Papers will be provided if necessary.
- 6) Use of Non-Programmable scientific calculators is allowed.

SECTION - I

Q.1) Answer the following: (10 Marks X 1 = 10 Marks)

Define Linear Programming Problem (LPP) and explain the components of LPP.

Q.2) Answer the following: (10 Marks X 1 = 10 Marks)

Apply graphical method to solve the following LPP

$$\text{Maximize } Z = 2x_1 + x_2$$

Subject to, $x_1 + 2x_2 \leq 10$

$$x_1 + x_2 \leq 8$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

Q.3) Answer the following: (10 Marks X 1 = 10 Marks)

Find the initial basic feasible solution by north west corner rule and check whether it is optimal or not.

Warehouse Factory	X	Y	Z	Supply
A	32	35	31	120
B	27	28	30	137
C	28	34	31	160
Demand	170	180	150	

Q.4) Answer the following: (10 Marks X 1 = 10 Marks)

Inter-arrival times and consultation times at a doctor's clinic are as follows :

Inter arrival time (in minutes)	Probability
4	0.20
8	0.24
12	0.36
16	0.20

Consultation time (in minutes)	Probability
5	0.30
8	0.25
11	0.20
14	0.15
17	0.10

Simulate the system for the next ten patients at the doctor's clinic and find the idle time of doctor and waiting times of patients. Assume that the consultation begins at 9.00 a.m.

Use the following random numbers

Inter-arrival Time : 24, 55, 36, 45, 88, 98, 65, 01, 76, 68

Consultation time : 54, 33, 21, 09, 99, 80, 65, 44, 03, 36.

Q.5) Write short notes on the following: Attempt ANY TWO (5 Marks X 2 = 10 Marks)

- Role of operations research in modern management
- Degeneracy in Transportation problem
- Advantages of Simulation

SECTION -II

Q.6) Answer the following: (15 Marks X 1 = 15 Marks)

- Following is the data pertaining to requirement at outlets, production capacities, and the cost of transportation (cost in Rs. Per unit)

	Outlets				
To From Factory	O ₁	O ₂	O ₃	O ₄	Capacity
F ₁	9	7	10	8	15
F ₂	8	11	9	11	27
F ₃	13	10	12	10	14
Requirement	15	19	11	10	

Find the optimal transportation schedule and the minimum transportation cost.

Q.7) Answer the following: (15 Marks X 1 = 15 Marks)

For the following cost matrix

Teams	P	Q	R	S
A	25	24	24	23
B	26	27	30	25
C	32	33	30	31
D	27	28	29	30

Find the optimal assignment.

Q.8) Answer the following: (15 Marks X 1 = 15 Marks)

Consider the following schedule of activities and related information for the construction of new plant.

Activity	Expected time (Months)	Expected cost (Rs. 00,000's)
1-2	4	5
2-3	2	3
3-6	3	4
2-4	6	9
1-5	2	2
5-6	5	12
4-6	9	20
5-7	7	7
7-8	10	14
6-8	1	4

Find

- The critical path
- Expected cost of construction of the plant
- Expected time required to build the plant
