JUNE – JULY 2023 EXAMINATION
M.Sc. II Semester
MA94207: OPERATIONS RESEARCH

Time: 3 Hrs] **[Max Marks: 70**

Note: Attempt all the questions. Each question has five subparts. Parts a, b, and c is compulsory and attempt any one from d and e.

			Marks	CO	BL
1.	(a)	Enlist the main components of Linear Programming Problem.	(02)	CO1	BL1
	(b)	In which condition we make using of Big-M method to solve an LPP?	(02)	CO1	BL2
	(c)	Define Slack and Surplus variables. Give an example of each.	(03)	CO1	BL2
	(d)	Use graphical method to solve the following linear programming problem:	(07)	CO1	BL3

$$\text{Maximize } Z = 3x_1 + 8x_2$$
$$\text{Subject to } x_1 + x_2 = 200$$
$$x_1 \le 80$$
$$x_2 \ge 60$$
$$\text{and } x_1, x_2 \ge 0$$

OR

	(e)	Solve the linear programming problem using Simplex Method:	(03 +04)	CO1	BL3

$$\text{Maximize } Z = 4x_1 + 10x_2$$
$$\text{Subject to } 2x_1 + x_2 \le 10$$
$$2x_1 + 5x_2 \le 20$$
$$2x_1 + 3x_2 \le 18$$
$$\text{and } x_1, x_2 \ge 0$$

2.	(a)	What are the various methods to find initial basic feasible solution of Transportation Problem?	(02)	CO2	BL2
	(b)	Define saddle point in Game Theory.	(02)	CO2	BL1
	(c)	Solve the following two person zero sum game:	(03)	CO2	BL2

	B_1	B_2	B_3
A_1	2	4	5
A_2	10	7	9
A_3	4	4	6

	(d)	Find an optimal assignment from the following matrix:	(07)	CO2	BL3

Jobs

Operators	J_1	J_2	J_3	J_4
O_1	6	2	5	3
O_2	2	5	8	7
O_3	7	8	6	9
O_4	6	2	3	4

OR

	(e)	Use Vogel's Approximation method to obtain an initial basic feasible solution of transportation problem:	(07)	CO2	BL3

	D_1	D_2	D_3	D_4	*Available*
S_1	11	13	17	14	250
S_2	16	18	14	10	300
S_3	21	24	13	10	400
Demand	200	225	275	250	

3. (a) Define the terms CPM and PERT. (02) CO3 BL1
(b) What are the three time estimates in PERT? (02) CO3 BL2
(c) Write an algorithm for solving a problem involving *n–jobs* through *2*–machines. (03) CO3 BL2
(d) Consider the details of the project as shown in the table: (07) CO3 BL3

Activity	A	B	C	D	E	F	G	H	I
Precedence Relationship	--	--	--	A	A	B,D	C	B,G	F,G
Time	23	8	20	16	24	18	19	4	10

OR

(e) Find the optimal sequence, idle times of machines and total elapsed time for the following problem: (07) CO3 BL3

		Jobs				
		J_1	J_2	J_3	J_4	J_5
Machine	A	3	6		5	7
	B	7	5	6	5	6
	C	8	7	9	8	9

(i) Construct the CPM Network
(ii) Determine the critical path and project completion time.

4. (a) Define encoding. (02) CO4 BL1
(b) Give the mathematical definition of information. (02) CO4 BL1
(c) What are the major components of communication system? (03) CO4 BL2
(d) Explain the use and applications of Information theory in real life. (07) CO4 BL3

OR

(e) Devise the Shannon-Fano encoding procedure for the following data to obtain uniquely decodable code. What is the average length, efficiency and redundancy of the code that you obtain? (07) CO4 BL3

A	B	C	D	E	F
0.04	0.04	0.12	0.12	0.24	0.44

5. (a) Define Dynamic Programming. (02) CO5 BL2
(b) What is Bellmen's Principal of optimality? (02) CO5 BL2
(c) Differentiate between linear and non-linear programming by taking suitable example. (03) CO5 BL2
(d) Define Nonlinear programming problem and list different types of nonlinear programming problem. Also explain their application areas. (07) CO5 BL3

OR

(e) Use Kuhn Tucker conditions to solve the following non-linear programming problem: (07) CO5 BL2

Maximize $z = 2x_1^2 + 12x_1x_2 - 7x_2^2$; *subject to* $2x_1 + 5x_2 - 98 \leq 0$