NY—387—2023

FACULTY OF SCIENCE

M.Sc. (First Year) (Second Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(New/CBCS Pattern)

MATHEMATICS

Paper–XI

(Operation Research)

(Friday, 15-12-2023) **Time : 10.00 a.m. to 1.00 p.m.**

Time—3 Hours *Maximum Marks—75*

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

1. (a) Solve by using Simplex method : 15

Maximize $Z = 12x_1 + 15x_2 + 14x_3$

Subject to the constraints

$$-x_1 + x_2 \leq 0$$

$$-x_1 + 2x_3 \leq 0$$

$$x_1 + x_2 + x_3 \leq 100$$

$$x_1,\ x_2,\ x_3 \geq 0$$

P.T.O.

Or

(b) Solve by using Big M-method :

Minimize $Z = 2y_1 + 3y_2$

Subject to constraints

$$y_1 + y_2 \geq 5$$

$$y_1 + 2y_2 \geq 6$$

$$y_1, y_2 \geq 0$$

2. (a) Find the optimum solution to the transportation problem in which the cells contain the transportation cost in rupees : 15

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	100

Or

(b) Supply from origins, requirements at destinations and cost of shipping from origins to destinations in the form of a matrix is shown below :

Distribution centres (Destinations)

		1	2	3	4	Supply
	1	2	3	11	7	6
Plants (origins)	2	1	0	6	1	1
	3	5	8	15	9	10
Requirements		7	5	3	2	17

Find the transportation cost (basic feasible solution) by using North-West corner rule and Row minima method.

3. (a) Four different jobs can be done on four different machines. The set up and take down time costs are assumed to be prohibitively high for changeovers. The matrix below gives the cost in rupees of producing job i on machine j : 15

Machines

		M_1	M_2	M_3	M_4
	J_1	5	7	11	6
	J_2	8	5	9	6
Jobs	J_3	4	7	10	7
	J_4	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimized ?

P.T.O.

Or

(b) A company has a team of four salesmen and there are four districts where the company wants to start its business. After taking into account the capabilities of salesman and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is as below :

District

		1	2	3	4
	A	16	10	14	11
Salesman	B	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

Find the assignment of salesman to various districts which will yield maximum profit.

4. (a) In a game of matching coins, player A wins Rs. 2 if there are two heads, wins nothing if there are two tails and loses Rs 1 when there are one head and one tail. Determine the payoff matrix, best strategies for each

player and the value of game to A. 15

Or

(b) Solve the game by using the principle of dominance : 15

Player B

	I	II	III	IV	V	VI
1	4	2	0	2	1	1
2	4	3	1	3	2	2
Player A 3	4	3	7	−5	1	2
4	4	3	4	−1	2	2
5	4	3	3	−2	2	2

5. Attempt any *three* of the following : 15

(a) Define feasible solution, basic feasing solution, optimal solution used while studying simplex method.

(b) Explain the steps in transportation model.

(c) Solve the minimal assignment problem whose effectiveness matrix is

	1	2	3	4
I	2	3	4	5
II	4	5	6	7
III	7	8	9	8
IV	3	5	8	4

(d) Write a note on competitive game.