RAN-2508000605030002

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B.Com. Data Science (Sem.- V) Examination October - 2025

Minor - Optimization Techniques

[Total Marks: 50

સૂચના : / Instructions
(1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book

Seat No.:

Student's Signature

Q.1. Answer the following Short questions (any five) (10)

1. What is Optimization?
2. Define Minimization problem in Optimization.
3. What is Linear Programming?
4. A person requires three types of chemical A, B and C for his garden. The minimum requirements of these chemicals are respectively 10, 12 and 12 units. These chemicals are available in liquid from in jars or in powder from in packets. A jar contains 5, 2 and 1 units of A, B and C respectively. A packet contains 1, 2 and 4 units of A, B and C respectively. The price of a jar is Rs.3 and that of a packet is Rs.2. Formulate this minimization problem as a Linear programming problem.
5. Give the meaning of Integer Programming.
6. Obtain the total transportation cost by matrix minima method for the following transportation problem.

	D_1	D_2	Supply
F_1	112	192	80
F_2	128	160	120
Demand	88	112	

7. Explain the term: Basic solution

Q.2 (A) Two machines A and B are used in manufacturing foot-balls and volleyballs. The machine A is to be used for 2 minutes and the machine B is to be used for 3 minutes to manufacture a foot-ball, while the machine A is to be used for 4 minutes and the machine B is to be used for 2 minutes to manufactures a volley-ball. Each machine can be used for at the most 2 hours a day. Each foot-ball gives a profit of Rs.4 and each volley-ball gives a profit of Rs.5. How many foot-balls and volley-balls should be manufactured per day to earn maximum profit? Solve the linear programming problem by graphical method. **(08)**

(B) Find the initial basic feasible solution for the following transportation problem by Min(Min-Max) method. **(06)**

Warehouse	Centre				Supply
	C_1	C_2	C_3	C_4	
A	23	27	16	18	30
B	12	17	20	51	40
C	22	28	12	32	53
Demand	22	35	25	41	123

OR

Q.2 (A) Solve the following linear programming problem graphically. Find the minimum value of **(07)**

$Z = 2000x_1 + 1600x_2$

$6x_1 + 2x_2 \geq 12, \quad 2x_1 + 2x_2 \geq 8,$

$4x_1 + 12x_2 \geq 24, \quad x_1 \leq 7, \quad x_2 \leq 7$

$x_1, x_2 \geq 0$

(B) Find the initial basic feasible solution for the following transportation problem by VAM. **(07)**

Origin	Destination				Supply
	D_1	D_2	D_3	D_4	
O_1	5	8	3	6	30
O_2	4	5	7	4	50
O_3	6	2	7	5	40
Demand	30	20	40	30	120

Q.3. (A) Find the maximum value of Objective function $Z = 50x + 25y$ subject to the following constrains by using graphical method. **(08)**

$2x + 4y \leq 80, -6x - 2y \leq -60, -8x - 6y \leq -120, \quad x, y \geq 0$

(B) Find the initial basic feasible solution for the following transportation problem by Max(Min - Max) method. **(06)**

Factory	D_1	D_2	D_3	D_4	Supply
O_1	21	16	25	17	11
O_2	17	18	14	23	13
O_3	32	27	18	41	19
Demand	6	10	12	15	43

OR

Q.3. (A) Solve the following assignment problem to minimize the total cost. **(07)**

From	To					
	P	Q	R	S	T	U
A	41	62	39	52	25	51
B	22	29	49	65	81	50
C	27	29	60	51	32	32
D	45	50	48	52	37	43

E	29	40	39	26	30	33
F	82	40	40	60	51	30

(B) Solve the following assignment problem to minimize the total cost. **(07)**

Works	Persons			
	A	B	C	D
1	12	7	9	7
2	8	9	6	10
3	9	6	11	9
4	7	8	10	6
5	10	7	8	9

Q.4. Write short notes on: (Any three) **(12)**

1. Give the mathematical formulation of LPP and State its assumptions.
2. Explain the applications of LPP.
3. Give the mathematical formulation of TP and Describe the matrix minima method for solving TP.
4. Explain the Vogel's Approximation method for finding IBFS in TP.
5. Describe the Hungarian method for solving AP.