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240304

December, 2019

M.Sc. (Mathematics) - III SEMESTER

Operations Research (MATH17-116)

Time : 3 Hours] [Max. Marks : 75

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

1. (a) Describe the various objectives of OR. Write any *two* merits of OR. (1.5)

(b) How do you identify the presence of multiple optima in simplex Method. (1.5)

(c) What do you mean by infeasibility and unbounded in linear programming? Illustrate graphically. (1.5)

(d) What is unbalanced Transportation problem? How do you start in this case. (1.5)

(e) What is degeneracy in transportation problem? How is it resolved? (1.5)

(f) Define assignment problem and give its mathematical formulation. (1.5)

(g) Discuss the algebraic method for solving 2×2 games by taking a suitable example. (1.5)

(h) What is the significance of utility as a basis of decision-making? (1.5)

(i) Explain EOQ in inventory. (1.5)

(j) What are the advantages of proper inventory management? (1.5)

PART - B

2. (a) Solve the following LPP by graphical method:

Max $z = 2x_1 + x_2$

Subject to the constraints:

$x_1 + 2x_2 \leq 10,\ x_1 + x_2 \leq 6,\ x_1 - x_2 \leq 2,$

$x_1 - 2x_2 \leq 1$ and $x_1, x_2 \geq 0.$ (7)

(b) Solve the following LPP by Big-M method:

Max $z = 3x_1 - x_2$

Subject to the constraints:

$2x_1 + x_2 \leq 2,\ x_1 + 3x_2 \leq 3,\ x_2 \leq 4$ and $x_1, x_2 \geq 0.$

(8)

3. (a) Solve the following LPP using Simplex Method

Max $z = 30x_1 + 23x_2 + 29x_3$

Subject to :

$$6x_1 + 5x_2 + 3x_3 \leq 26$$

$$4x_1 + 2x_2 + 5x_3 \leq 7$$

$$x_1, \ x_2, \ x_3 \geq 0.$$ (7)

(b) Solve the following LPP using Dual Simplex Method

Max $z = -2x_1 - x_3$

Subject to :

$$x_1 + x_2 - x_3 \geq 5$$

$$x_1 - 2x_2 + 4x_3 \geq 8$$

$$x_1, x_2, x_3 \geq 0.$$ (8)

4. Find the optimum solution of the following transportation problem(IBFS by Vogels approximation method)

To → / From ↓	W_1	W_2	W_3	W_4	W_5	Plant capacity
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
Requirements	30	30	15	20	5	

(15)

5. (a) Find the optimal solution (cost minimizing) of the following assignment problem:

Jobs → / Machines ↓	I	II	III	IV	V
A	11	10	18	5	9
B	14	13	12	19	6
C	5	3	4	2	4
D	15	18	17	9	12
E	10	11	19	6	14

(7)

(b) Prove that if an LPP has an optimal feasible solution, its dual also has optimal feasible solution. (8)

6. (a) What are inventory models? Enumerate various types of inventory models and describe them briefly. (7)

(b) What are the advantages and disadvantages of increased inventory? Briefly explain the objectives that must be fulfilled by an inventory control system. (8)

7. (a) Explain the principle of dominance in game theory and solve the following game:

Player B → / Player A ↓	B_1	B_2	B_3	B_4	B_5
A_1	10	4	2	9	1
A_2	7	6	5	7	8
A_3	3	5	4	4	9
A_4	6	7	3	3	2

(7)

(b) Solve the following game graphically:

Player B → / Player A ↓	B_1	B_2	B_3	B_4	B_5	B_6
A_1	8	–4	–8	1	–6	–8
A_2	–7	–5	–1	–6	–3	4

(8)