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D-5338

M.Sc. (IIIrd Semester) Examination, 2020

MATHEMATICS

(Operation Research - I)

Time Allowed : Three Hours

Maximum Marks : 70

SECTION - A

Note : Attempt all ten questions. Each question carries one mark. **1×10=10**

Q. 1. Fill in the blanks :

(1) Both objective function and constraints are expressed in _____ form.

(2) The collection of all feasible solutions is known as the _____ region.

(3) The assignment problem is solved by _____ method.

(4) Transportation problem is basically a _____ model.

(5) '$\leq$' constraints changes to _____ type in dual L.P.

Multiple choice type questions :

(6) While solving LP model graphically, the area bounded by the constraints is called :

(a) Unbounded solution

(b) Infeasible region

(c) Feasible region

(d) None of the above

(7) The key column indicates :

(a) Outgoing variable

(b) Incoming variable

(c) Independent variable

(d) Dependent variable

(8) The MODI method is used to :

(a) Identify an outgoing arc

(b) Identify an incoming arc

(c) Identify unoccupied cells

(d) Identify and initial feasible solution

(9) Northwest corner rule is one of the method of solving :

(a) Queuing theory

(b) Transportation models

(c) Game theory

(10) Dual of a dual is :

(a) Primal

(b) Dual

(c) Prima Dual

(d) None of the above

SECTION - B

Note : Attempt any five questions. Each question carries 2 marks. **5×2=10**

Q. 2. (1) Define convex set.

(2) Write two application of assignment problem.

(3) Comment on scientific method of O.R.

(4) What do you mean by unbounded solution in L.P.P. ?

(5) What do you mean by unbalanced transportation problem ?

(6) Wha is goal programming ?

(7) Define slack and surplus variable in L.P.P.

SECTION - C

Note : Attempt any five questions. Each question carries 4 marks. **5×4=20**

Q. 3. Short answer type (250 words) :

(1) Solve graphically :

Max. $z = 45x_1 + 80x_2$

subject to $5x_1 + 20x_2 \leq 400$

$10x_1 + 15x_2 \leq 450$

and $x_1 \geq 0,\ x_2 \geq 0$

(2) Examine the convexity of the set :

$$S = \left\{(x_1, x_2); x_1^2 + x_2^2 \leq 1, x_1 + x_2 \geq 1\right\}$$

(3) Solve the following L.P.P. by using two phase method :

Min. $z = x_1 + x_2$

subject to $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1, x_2 \geq 0$

(4) Solve the following assignment problem and find optimal solution :

		Task			
		1	2	3	4
Employee	1	5	8	8	6
	2	4	6	5	8
	3	6	10	7	4
	4	9	9	7	3

(5) Describe northwest corner method of transportation problem.

(6) An office equipment manufacture, produces two kinds of products, chairs and lamps. Production of either a chair or a lamp

requires 1 hour of production capacity in the plant. The plant has a maximum capacity of 10 hours per week. The gross margin from the sale of a chair is Rs. 80 and Rs. 40 for that of a lamp. Formulate the problem as a goal programming problem if the goal of the firm is to earn a profit of Rs. 800 per week.

(7) Write the dual of the following primal LP problem :

Maximize $z = x_1 + 2x_2 + x_3$

subject to $2x_1 + x_2 - x_3 \leq 2$

$2x_1 - x_2 + 5x_3 \leq 6$

$4x_1 + x_2 + x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

SECTION - D

Note : Attempt any three questions. Each question carries 10 marks. **3×10=30**

Q. 4. (1) Solve the following L.P.P. problem :

Maximize $z = 3x_1 + 5x_2 + 4x_3$

subject to $2x_1 + 3x_2 \leq 8$

$2x_2 + 5x_3 \leq 10$

$3x_1 + 2x_2 + 4x_3 \leq 15$

and $x_1, x_2, x_3 \geq 0$

(2) Solve the following L.P. problem :

Maximize $z = x_1 + 2x_2 + 3x_3 - x_4$

subject to $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1 + 2x_2 + x_3 + x_4 = 10$

$x_1, x_2, x_3, x_4 \geq 0$

(3) For the following L.P.P. :

Minimize $z = \lambda x_1 - \lambda x_2 - x_3 + x_4$

subject to $3x_1 - 3x_2 - x_3 + x_4 \geq 5$

$2x_1 - 2x_2 + x_3 - x_4 \leq 3$

$x_1, x_2, x_3, x_4 \geq 0$

Find the range of λ over which the solution remain basic feasible and optimal.

(4) Solve the following transportation problem and apply the test of optimality :

		Ware Houses				
		w_1	w_2	w_3	w_4	Supply
Origin	F_1	21	16	25	13	11
	F_2	17	18	14	23	13
	F_3	32	27	18	41	19
Demand		6	10	12	15	