Total No. of Questions : 3]

SEAT No. :

PA-1020

[Total No. of Pages : 4

[5902]-44

S.Y. B.Sc. (Computer Science)

MATHEMATICS

MTC - 242 : Operations Research

(2019 Pattern) (Semester - IV) (Paper - II) (24222)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Non-programmable scientific calculator is allowed.***

Q1) Attempt any Five of the following : **[5 × 2 = 10]**

a) Use north-west corner rule to obtain Initial Basic Feasible Solution of the following transportation problem :

Destination → / Origin ↓	D_1	D_2	D_3	Supply
O_1	5	1	8	12
O_2	2	4	0	14
O_3	3	6	7	4
Demand	9	10	11	

b) Write dual form of the following Linear Programming Problem :

Minimize $Z = 10\,x_1 + 6x_2 + 2x_3$

Subject to :

$$-x_1 + x_2 + x_3 \geq 1$$

$$3x_1 + x_2 - x_3 \geq 2$$

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

P.T.O.

c) Solve following assignment problem for Maximization :

Jobs → Persons ↓	I	II	III
A	1	4	5
B	2	3	3
C	3	1	2

d) What is degeneracy in the transportation problem?

e) Write the mathematical formulation of assignment problem.

f) Write the standard form of following Linear Programming Problem :

Minimize $Z = x_1 + x_2 + x_3$

Subject to :

$$x_1 - 3x_2 + 4x_3 = 5$$
$$x_1 - 2x_2 \leq 3$$
$$2x_1 - x_3 \geq 4$$
$$x_1, x_2, x_3 \geq 0$$

g) Draw the feasible region for the following constraints :

Maximize $Z = 3x + 2y$

Subject to :

$$x - y \leq 1$$
$$x + y \geq 3$$
$$x, y \geq 0$$

Q2) Attempt any three of the following : **[3 × 5 = 15]**

a) Obtain Initial Basic Feasible Solution of the following transportation problem by Vogel's approximation method.

Warehouses → Factory ↓	W_1	W_2	W_3	W_4	Supply
F_1	30	25	40	20	100
F_2	29	26	35	40	250
F_3	31	33	37	30	150
Requirement	90	160	200	50	

b) Solve the following assignment problem :

	A	B	C	D	E
M_1	4	6	10	5	6
M_2	7	4	-	5	4
M_3	-	6	9	6	2
M_4	9	3	7	2	3

c) Solve the following linear programming problem by graphically :

Maximize $Z = 3x + 5y$

Subject to :

$$x + 2y \leq 2000$$

$$x + y \leq 1500$$

$$y \leq 600$$

$$x, y \geq 0$$

d) Solve the following Linear Programming Problem by Big-M method.

Maximize $Z = x + 4y$

S.t.

$$x + 2y \leq 2$$

$$4x + 3y \geq 12$$

$$x, y \geq 0$$

e) Solve following assignment problem for minimum cost :

	I	II	III	IV	V
1	3	8	2	10	3
2	8	7	2	9	7
3	6	4	2	7	5
4	8	4	2	3	5
5	9	10	6	9	10

Q3) Attempt any one of the following : **[1 × 10 = 10]**

a) Obtain optimal solution of the following Transportation Problem by modified distribution method.

1 (20)	2	1 (10)	4
3	3 (20)	2 (20)	1 (10)
4	2 (20)	5	9

Also obtain alternate optimal solution

b) Solve the following linear programming problem by simplex method :

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to :

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

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

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Total No. of Questions : 3]

SEAT No. :

P5146

[Total No. of Pages : 4

[5823]-404

S.Y. B.Sc. (Computer Science)

MATHEMATICS

MTC-242 : Operations Research

(2019 Pattern) (Semester - IV) (Paper - II) (24222)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***All Questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Non-programmable scientific calculator is allowed.***

Q1) Attempt any Five of the following. **[5 × 2 = 10]**

a) Write two applications of Linear programming problem.

b) How an assignment problem with certain restrictions can be solved?

c) Write dual form of the following Linear programming problem :

Maximize $Z = x_1 + 3x_2$

Subject to

$3x_1 + 2x_2 \leq 6$

$3x_1 + x_2 = 4$

$x_1, x_2 \geq 0$

d) Obtain Initial Basic Feasible solution of the Transportation Problem using Matrix Minima Method.

Destination → / Origin ↓	D_1	D_2	D_3	Supply
O_1	10	13	6	10
O_2	16	7	13	12
O_3	8	22	2	8
Demand	6	11	13	30

P.T.O.

e) Solve the following Assignment Problem for minimization :

Jobs → Persons ↓	I	II	III
A	7	3	5
B	2	7	4
C	6	5	3
D	3	4	7

f) Write the standard form of the following linear programming problem :

Minimize $Z = x_1 + x_2 + x_3$

Subject to :

$$x_1 - 3x_2 + 4x_3 = 5$$
$$x_1 - 2x_2 \leq 3$$
$$2x_1 - x_3 \geq 4$$
$$x_1, x_2, x_3 \geq 0$$

g) Draw the Feasible region for the following constraints :

Max $Z = 3x - 2y$

Subject to

$$x + y \leq 1$$
$$2x + 2y \geq 4$$
$$x, y \geq 0$$

Q2) Attempt any three of the following : **[3 × 5 = 15]**

a) Solve the following assignment problem to minimize the cost such that Machine. M_2 cannot be assigned Job - C and Machine M_3 cannot be assigned Job - A.

	A	B	C	D	E
M_1	9	11	15	10	11
M_2	12	9	-	10	9
M_3	-	11	14	11	7
M_4	14	8	12	7	8

b) Solve the following Linear Programming Problem by Big-M method :

Maximize $Z = 3x_1 - x_2$

Subject to :

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 3$$

$$x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

c) Solve the following assignment problem For minimum cost :

	A	B	C	D	E
M_1	7	5	9	8	11
M_2	9	12	7	11	10
M_3	8	5	4	6	9
M_4	7	3	6	9	5
M_5	4	6	7	5	11

d) Solve the Linear Programming Problem by graphically.

Max. $Z = 9x + 13y$

Subject to :

$$2x + 3y \leq 18$$

$$2x + y \leq 10$$

$$x, y \geq 0$$

e) Solve Transportation Problem by north - west corner rule.

	I	II	III	IV	V	VI	Capacity
A	9	12	9	8	4	3	5
B	7	3	6	8	9	4	8
C	4	5	6	8	10	14	6
D	7	3	5	7	10	9	7
E	2	3	8	10	2	4	3
Requirement	3	4	5	7	6	4	

Q3) Attempt any one of the following : **[1 × 10 = 10]**

a) Find Initial Basic Feasible solution by vogel's Approximation method. Obtain the optimal solution by Modified Distribution method of the following transportation problem.

Ware houses → Factory ↓	W_1	W_2	W_3	W_4	Supply
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	34

b) i) Solve the following Linear Programming problem by simplex method.

Max. $Z = 6x + 3y$

Subject to :

$2x + y \leq 8$

$3x + 3y \leq 18$

$y \leq 3$

$x, y \geq 0$

ii) Write an algorithm to solve assignment problem