Total No. of Questions : 3]

SEAT No. :

PA-1019

[Total No. of Pages : 2

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

MATHEMATICS (Paper - I)

MTC-241: Computational Geometry

(2019 Pattern) (Semester - IV) (24221)

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

Instructions to the candidates :

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

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

a) Find homogenous co-ordinate of point A = [1, 2].

b) If $A(\Delta ABC) = 5$ sq. unit is reflected through $y = x$ line, find Area of transformed object.

c) Find Foreshortening factor f_y of the transformation Matrix for Axonometric projection.

$$[T] = \begin{bmatrix} 0.5 & 0.43 & 0 & 0 \\ 0 & 0.86 & 0 & 0 \\ 0.86 & 0.25 & 0 & 0 \\ 0.58 & 0.75 & 0 & 1 \end{bmatrix}$$

d) Find direction cosines of the plane $x + y + z = 0$.

e) Write types of all Axonometric parallel projections.

f) Define projection in three-Dimensional space.

g) Find Initial point of part of circle $x^2 + y^2 = 16$ in second quadrant.

P.T.O.

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

a) Show that 2 × 2 matrix $[T] = \begin{bmatrix} 2t & \frac{1}{t} \\ t & \frac{1}{t} \end{bmatrix}$

represents pure rotation in two-Dimensional space.

b) If circle $(x-1)^2 + (y+1)^2 = 9$ is transformed by translation in X-direction by 2 and Y-direction by 3 then find centre of transformed circle.

c) Find concatenated transformation matrix for the following sequence of transformation, First shearing in Y-direction proportional to x and z co-ordinate with 1 and 3 units respectively. Followed by Reflection through xz plane (i.e. $y = 0$ plane).

d) Obtain transformation matrix to Reflect the object through plane $x = -2$.

e) Develop the bottom view of the line segment AB where A = [0 0 1] and B = [1 0 1].

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

a) Find the parametric equation of Be'zier curve determine by four control points B_0 [0 2], B_1 [2 3] B_2 [3 2] and B_3 [2 0]. Also find position vectors of the point on the curve corresponding to parametric values $t = 0.2, 0.4, 0.6$.

b) i) Generate equispaced 3 points on the circle $x^2 + y^2 = 36$ in second quadrant only.

ii) Write the transformation matrix for dimetric projection with

$$f_z = \frac{3}{8} (\theta > 0, \phi > 0).$$

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Total No. of Questions : 3]

SEAT No. :

PA-1020

[Total No. of Pages : 4

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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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