Total No. of Questions :3] **SEAT No. :**

P1296 **[Total No. of Pages : 3**

[6055]-203
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.***
3) ***Non-Programmable scientific calculator is allowed.***

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

a) Write any two properties of Be′zier curve

b) If the transformation matrix $[T]=\begin{bmatrix} 4 & 3 \\ -1 & 2 \end{bmatrix}$ is used to transform rectangle with length 3 cm and breadth 5 cm respectively, then find area of transfermed figure.

c) Is $[T]=\begin{bmatrix} \frac{1}{2} & \sqrt{\frac{3}{2}} \\ -\sqrt{\frac{3}{2}} & \frac{1}{2} \end{bmatrix}$ gives a solid body transformation? Justify.

d) Determine forshortening factors f_x and f_z, if transformations matrix for axonometrix projection is $[T]=\begin{bmatrix} 0.5 & 0.43 & 0 & 0 \\ 0 & 0.86 & 0 & 0 \\ 0.86 & 0.25 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

e) Find $\delta\theta$ to generate uniformly spaced 20 point on the circle $x^2+y^2=?$ ($\delta\theta$ is the angle of rotation)

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f) Explain the effect of transformation matrix [T]= $\begin{bmatrix} 1 & 0 & -2 & 0 \\ 0 & 1 & 3 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ on three dimensional object.

g) Give transformation matrix in three dimensional space which gives trimetric projection for $\theta = 30^{o}$ and $\theta = 45^{o}$.

Q2) Attempt any Three of the following. **[3×5=15]**

a) Find combine transformation matrix for the following sequence of transformations.

i) Scaling in x and y co-ordinary by factors –1 and 2 units respectively.

ii) Reflection through X-axis.

iii) Rotation about origin by an angle 270°. Apply this combine transformation matrix on the point P [2–3]

b) Reflect Δ ABC through the line y = 3, where A[–2–3], B[–10–6] C[–15–10].

c) Find combine transformation matrix for the following sequence of transformations.

i) Rotation about y–axis by an angle –30°

ii) Rotation about x–axis by an angle 45°

iii) Perspective projection with centre of projection on z-axis at the point [0.0,2.5,1]

d) Obtain isometric projection of the line segment joining the points [1–2 1] and [31–6] $(\theta > 0, \phi > 0)$.

e) Consider the line with direction ratios 1,1,1 and passing through the origin. Determine angles through which the line should be rotated about x-axis and then about y-axis so that it coincide with z-axis.

Q3) Attempt any One of the following. **[1×10=10]**

a) Find parametric equation of Be′zier curve determined by control points $B_0[-1-1]$ $B_1[2\ 3]$ B_2 [3 3], $B_3[5\ 2]$. Also find P(0.6), P(0.7), P(0.8).

b) i) Obtain uniformly spaced three points in the first quadrant of the circle $x^2+y^2=16$.

ii) Find cavalier and cabinet projection of the object represented by the following position vector matrix [X] with horizontal inclination

$\alpha=25°$, where $[X]=\begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & -1 \\ -1 & -2 & 1 \\ 2 & 1 & 1 \end{bmatrix}$

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