MMTE–004

M. Sc. MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE
Term-End Examination
December, 2023

MMTE-004 : COMPUTER GRAPHICS

Time : 1$\frac{1}{2}$ Hours *Maximum Marks : 25*

Note : *Question No. **1** is compulsory. Attempt any **three** questions out of Question Nos. **2** to **5**. Calculators are not allowed.*

1. State whether the following statements are True *or* False. Justify your answer. 10

   (a) Staircase effect appears in Bresenham line generation algorithm.

   (b) Two successive rotations are additive in nature.

   (c) Parametric equation $P + t(Q - P)$ holds for parallel projection, where P is the centre of projection and Q is the position of object.

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(d) Given a rectangular window with opposite corners at (0, 0) and (5, 5), the line $x = 6$ will be clipped by the given window region.

(e) The spline curves need not be continuous at all the control points.

2. (a) A geometric transformation is given by the following matrix for a print $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ in 2D.

$$\begin{bmatrix} 2 & 0 & 4 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

What will be the transformed position of a triangle with vertices $\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.   3

(b) Give *two* differences between cabinet and cavalier projections.   2

3. (a) Why the Bresenham's line drawing algorithm is more efficient than DDA line drawing algorithm ?   2

(b) Find out the first five pixel positions to plot a circle with radius 10 and centre at (50, 50) using the midpoint circle generation algorithm. 3

4. Given the four control points (0, 0), (20, 20), (40, 20), (60, 0), how will you construct a Bézier curve ? Write the formula and compute a point on the curve for the parameter value $t = \dfrac{1}{2}$. 5

5. (a) Write the transformation matrix for rotating a triangle with vertices A(1, 1), B(5, −1) and C(4, 6) about the origin by 45° in anticlockwise direction. 3

(b) When the parallel projection will be more suitable than a perspective projection ? Give an example to support your answer. 2

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