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MMTE-004

M.Sc. (MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE)

M.Sc. (MACS)

00205

Term-End Examination

June, 2018

MMTE-004 : COMPUTER GRAPHICS

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

(Weightage : 50%)

Note : *Question no. **1** is **compulsory**. Attempt any **three** questions out of questions no. 2 to 5. Use of calculator is **not** allowed.*

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1. State whether the following statements are *True* or *False*. Justify your answers. *5×2=10*

(a) Pixel mask means "A string containing only 0's."

(b) A heavy line on a video monitor could be displayed as adjacent perpendicular lines.

(c) In Bresenham's algorithm, while generating a circle, it is easy to generate one octant first and the other by successive reflection.

(d) Uniform scaling and rotation form a commutative pair of operations.

(e) The perspective projection onto the view plane z = 2 where the centre of projection is the origin (0, 0, 0) is the matrix

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

2. (a) Write the output obtained after the execution of the following OpenGL statements : *2*

```
glRotatef(90, 0, 0, 1);
glScalef(2, 2, 2);
glTranslatef(1, 0, 0);
```

(b) Distinguish between the following : *3*

(i) Shadow mask method and Beam penetration method.

(ii) Scaling transformation and Shearing transformation.

(iii) Interpolation spline and Approximation spline.

3. (a) Use Bresenham's line algorithm to rasterize the line from (5, 5) to (13, 9). *3*

(b) Transform the scene in the world coordinate system with the view point at (3, 3, 3). The view plane normal vector is (–1, –1, –1) and the view up vector is (0, 0, 1). *2*

4. (a) Show that a transformation matrix for a reflection about the line $y = -x$ is equivalent to a reflection relative to the x-axis, followed by a counter clockwise rotation of 90. *3*

(b) Show that a 2×2 matrix

$$T = \begin{bmatrix} \frac{1-t^2}{1+t^2} & \frac{2t}{1+t^2} \\ \frac{-2t}{1+t^2} & \frac{1-t^2}{1+t^2} \end{bmatrix}$$

represents a rotation. *2*

5. Use the Liang-Barsky line clipping algorithm to clip the line $P_1(-15, -30) - P_2(30, 60)$ against the window having diagonally opposite corners as (0, 0) and (15, 15). *5*