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MMTE-004

M. SC. (MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE) [M. SC. (MACS)]

Term-End Examination

June, 2023

MMTE-004 : COMPUTER GRAPHICS

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

Weightage : 50%

Note : *(i) Question **No. 1** is compulsory.*

*(ii) Attempt any **three** questions out of question no. **2** to **5**.*

(iii) Use of calculator is not allowed.

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1. State whether the following statements are true *or* false. Justify your answers : 2×5=10

   (i) The 2 × 2 matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ represents a 2-dimensional rotation.

(ii) Cohen-Sutherland algorithm can be used for both 2D and 3D clipping using 4 bit binary region codes.

(iii) The midpoint line generation algorithm requires performing integer calculations only.

(iv) The area of the ellipse that fits inside a rectangle with width w and height h is wh.

(v) There can be only one principal vanishing point in a projected image.

2. (a) Consider three different raster systems with resolutions of 640 × 480, 1280 × 1024 and 2560 × 2048, respectively. What size frame buffer in kilobytes is needed for each of these systems to store 24 bits per pixel ? How long would it take to load a 1280 × 1024 frame buffer in the same system, if 104 bits can be transferred per second ? 3

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

3. Transform the scene in the world coordinate system to the viewing coordinate system with viewpoint at (2, 2, 2). The view plane normal vector is (–1, –1, –4) and the view up vector is (0, 0, 1). 5

4. Plot a circle at (5, 5) having a radius of 5 units using the midpoint circle drawing algorithm. Do only three iterations. 5

5. Find the equation of the Bezier curve which passes through (0, 1) and (4, 1) and is controlled by (2, 5) and (3, – 1). 5