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

Term-End Examination

June, 2022

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 with a short proof or a counter-example :　　　5×2=10

    (a) Image aspect ratio is same as its resolution.

(b) Boundary fill algorithm is suitable for regions with boundary having more than one colour.

(c) For a given line segment, the Cohen-Sutherland line clipping algorithm checks first for its trivial rejection, and then tests for its trivial acceptance.

(d) The reflection about the line $y = x$ is attained by reversing x, y coordinates.

(e) The matrix $\begin{bmatrix} \sqrt{\dfrac{3}{2}} & -\dfrac{1}{2} \\ \dfrac{1}{2} & \dfrac{\sqrt{3}}{2} \end{bmatrix}$ represents a rotation.

2. (a) Reflect the pyramid A (1, 0, 0), B (0, 1, 0), C (0, 0, 1) and D (0, 0, 0) about XY-plane.   2

(b) Use the Cohen-Sutherland algorithm to clip the line P_1 (70, 20) and P_2 (100, 10) against a rectangular window with lower left corner (50, 10) and upper right hand corner (80, 40). 3

3. (a) Perform a 45° rotation of the triangle A (1, 0), B (0, 1) and C (1, 1). 2

(b) Let origin be the centre of projection. Find the perspective projection when the plane passes through the point (2, 3, −1) and has normal vector (1, 1, 1). 3

4. (a) Explain the midpoint circle generation algorithm and demonstrate it for a circle of radius $r = 8$ with centre at the origin, upto three iterations. 3

(b) Explain Bresenham's line generation algorithm and trace the algorithm for a line segment with vertices (10, 12) and (15, 15). 2

5. (a) Let P(t) be the Bezier cubic curve defined on the interval [0, 1] with control points P_0 (0, 0), P_1 (6, 10), P_2 (10, 10), P_3 (20, 0). Find P(t).   3

    (b) Write two differences between parallel projection and perspective projection.   2

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