No. of Printed Pages : 4 **MMTE-004**

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

Term-End Examination

June, 2020

MMTE-004 : COMPUTER GRAPHICS

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

Weightage : 50%

***Note** : Question number 1 is compulsory. Attempt any three questions from Question Nos. 2 to 5. Use of calculator is not allowed.*

1. State whether the following statements are true *or* false. Justify your answer with a short proof or a counter-example : 10

   (a) Two successive reflections about an axis do not change the original object position.

(b) There can be only two principal vanishing points in a projected image.

(c) Bresenham's line drawing algorithm requires performing only integer calculations.

(d) The Liang-Barsky algorithm for line clipping cannot be used both in 2D and 3D.

(e) A Bezier curve passes through the first and last points of the control polygon.

2. (a) Use the Cohen-Sutherland algorithm to clip the line segment joining P_1 (70, 20) and P_2 (100, 10) against a window with lower left hand corner (50, 10) and upper right hand corner (80, 40). $2\frac{1}{2}$

(b) Reflect the pyramid A (1, 0, 0), B (0, 1, 0), C (0, 0, 1) and D (0, 0, 0) about the z-axis. $2\frac{1}{2}$

3. (a) Distinguish between the following : 2

(i) The shadow mask method and the beam penetration method.

(ii) Active matrix LCD and passive matrix LCD.

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

4. (a) Use the Bresenham's line generation algorithm for tracing a line segment with vertices (10, 12) and (20, 18). 2

(b) Use the midpoint circle algorithm to draw a circle of radius $r = 8$ units, with centre at the origin. Perform five iterations. 3

5. (a) Write the transformation matrix for rotating a triangle with vertices A (0, 0), B (6, 0) and C (3, 3) about the origin through 90°. Also write the coordinates of the transformed triangle. 2

(b) Find the equation of the Bezier curve which passes through (0, 0) and (–4, 2) and is controlled through (14, 10) and (4, 0). 3

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