

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

Term-End Examination

December, 2024

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 nos. 2 to 5.*

(iii) *Use of calculator is not allowed.*

1. State whether the following statements are true or false. Justify your answers : $5 \times 2 = 10$

(a) Colour CRT monitors with beam penetration method can produce picture only in two colours.

(b) Under the reflection about the line $y = -x$, the point $(1, 2)$ transforms to $(-2, -1)$.

- (c) Liang-Barsky algorithm is a bitwise line chipping algorithm.
- (d) The matrix :

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

represents a parallel projection.

- (e) The midpoint line generation algorithm requires performing integer calculations only.
2. Transform the scene in the world coordinate system to the viewing coordinate system with viewpoint at (1, 0, 2), view plane normal vector (1, -1, 2) and the view-up vector (1, 0, 0). 5
3. (a) Odd-even rule and the winding number rule always produce the same interior region. True or False ? Justify. 3
- (b) Trace the DDA line drawing algorithm for the line segment (0, 1) to (5, 8). 2
4. (a) Show that two successive 2D rotations commute, i.e., $R(\theta) R(\phi) = R(\phi) R(\theta)$. 2

- (b) Let W be the clip window with corners at (0, 0); (10, 0); (10, 5) and (0, 5). If Cohen-Sutherland line clipping algorithm is applied, which of the following lines will be trivially accepted, and which trivially rejected ? Justify your answers : 3
- (i) Line AB with A = (0, -1); B = (6, -2)
- (ii) Line CD with C = (8, 7); D = (12, 4)
- (iii) Line EF with E = (2, 1); F = (7, 2)
5. (a) What will be the new coordinates of the point P (1, 2, $\sqrt{3}$) if it is rotated about the y-axis by an angle of 60° and then scaled uniformly with a factor of $\frac{1}{2}$? 3
- (b) Write any *two* differences between parallel and perspective projection. 2

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