No. of Printed Pages : 3 **MMTE–004**

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

Term-End Examination

June, 2025

MMTE-004 : COMPUTER GRAPHICS

Time : 1½ Hours *Maximum Marks : 25*

Weightage : 50%

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

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

   (a) Multiplication of transformation matrices for two successive rotations is commutative.

(b) The focusing system in a CRT is needed to force the electron beam to converge into a small spot as it strikes the phosphor.

(c) A perspective projection preserves relative proportions.

(d) The bitmap character generation method uses spline curves to generate character shape.

(e) Random scan display technique can be used to draw realistic pictures.

2. (a) What do you understand by the terms persistence, refresh rate and resolution ? Explain. 3

(b) Differentiate between oblique and orthogonal projections. 2

3. (a) Show that, for all $\alpha, \beta \in \mathbf{R}$: 2

$$S_x^{shear}(\alpha) S_x^{shear}(\beta) = S_x^{shear}(\alpha + \beta)$$

(b) Find the uniform cube B-spline curve generated by the control points (1, 3), (4, 2), (– 1,– 1) and (2, 8). 3

4. (a) A geometric transformation is used in 2D to transform a triangle with vertices (0, 0), (1, 0), (1, 1) to another triangle (1, 1), (2, 1), (2, 2). Find out the transformation and write the same in the form :

$$x' = Ax + b,$$

where x' is the transformed point, x is the original point, A is a 2×2 matrix and b is a 2×1 vector. 5

5. (a) Find the matrix of projection for the cavalier projection. 2

(b) Write a C-code to draw a hexagon using OpenGL commands. 3

× × × × ×