No. of Printed Pages : 3 **MMTE-004**

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

00713

Term-End Examination

December, 2013

MMTE-004 : COMPUTER GRAPHICS

Time : 2 hours *Maximum Marks : 25*

(Weightage : 50%)

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

1. State whether the following statements are **true** or **false**. Justify your answer. **2x5=10**

(a) The Sutherland Cohen algorithm fails to clip a line if it is vertical and partly lying within the window.

(b) A cubic Bezier curve cannot be drawn if the control points are located at the vertices of a rectangle.

(c) Oblique projection with an angle of 45° to the horizontal plane is called as Cavalier projection.

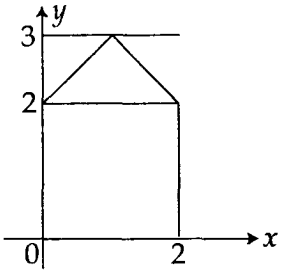
(d) The purpose of intersect function of a typical ray traces is to find the object that is closest to the camera.

(e) If the spacing between the knot sequence is uniformly doubled, the shape of the resulting B-spline curve changes.

2. (a) Consider a raster system with resolution of 1024×768 pixels and the colour palatte calls for 65,536 colours. What is the minimum amount of video RAM in mega bytes that the computer must have to support the above mentioned resolutions and number of colours ? 2

(b) Plot a circle at (5, 5) having a radius of 5 units using midpoint circle algorithm. 3

3. (a) Given a 2D house shaped object as shown below : 3



and a homogeneous transformation matrix M as given by :

$$M = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos 90 & -\sin 90 & 0 \\ \sin 90 & \cos 90 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

Draw the position of the house object after transforming it with matrix M.

(b) Write two differences each between :

(i) Parallel projection and perspective projection. 2

(ii) Shear transformation and composite transformation.

4. (a) If the control vector be $\begin{pmatrix} 0.0 & 0.0 & 0.0 \\ 0.25 & 0.0 & 1.0 \\ 0.50 & 0.0 & 0.50 \\ 1.0 & 1.0 & 2.0 \end{pmatrix}$ 3

then find the formula p(u) for the Bezier spline. Also find the point on spline at $u = 0.2$, and $u = 0.6$

(b) Show that the two scaling transformations are commutative. 2

5. (a) Suppose R be the window which has its lower left corner at $(-3, 1)$ and upper right corner at $(2, 6)$. Using cohen Sutherland line clipping algorithm, for each of the following line segments, state whether it is visible, invisible or partially visible. 3

(i) $(-4, 2)$ to $(-1, 7)$

(ii) $(-2, 3)$ to $(1, 2)$

(iii) $(-4, 7)$ to $(-2, 10)$

(b) Find the normalization transformation window to viewpoint, with window lower left corner at (1, 1) and upper right corner at (3, 5) onto a viewpoint with window, lower left corner at (0, 0) and upper right corner at $\left(\frac{1}{2}, \frac{1}{2}\right)$. 2