No. of Printed Pages : 4

MMTE-004

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

M.Sc. (MACS)

00672

Term-End Examination

December, 2014

MMTE-004 : COMPUTER GRAPHICS

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

(Weightage : 50%)

Note : *Question no. **1** is **compulsory**. Attempt any **three** questions from questions no. **2** to **5**. Use of calculators is **not** allowed.*

1. State whether the following statements are *true* or *false*. Justify your answer with the help of a short proof or a counter example. *5×2=10*

   (a) Raster scan is a scanning technique in which the electron sweeps from bottom to top and from left to right.

   (b) The area of the ellipse that fits inside a rectangle with width W and height H is WH.

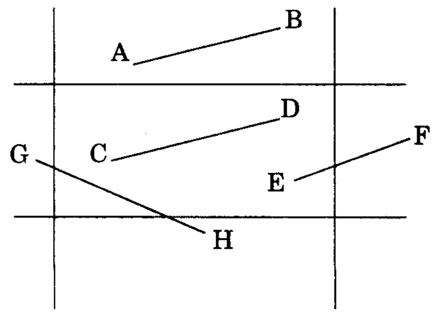
(c) A perspective projection preserves relative proportions.

(d) The matrix $\begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & -1 & 1 \end{pmatrix}$ is a 3D Cartesian rotation matrix.

(e) If a triangle is clipped in a window then it may not always have the same number of vertices.

2. (a) Explain Bresenham's line algorithm and trace the algorithm for a line segment with vertices (10, 5) and (15, 9). Do three iterations. *3*

(b) Find the region code for each line in the figure given below. Identify whether the line is completely visible, partially visible or completely invisible. *2*



3. (a) Plot a circle with centre at (0, 0) having radius of 8 units using mid-point circle algorithm. Do three iterations only. *3*

(b) Differentiate between :

(i) Shadow mask method and Beam penetration method.

(ii) Scaling transformation and Shearing transformation.

Give two differences for each. *2*

4. (a) Suppose there is a square ABCD where A(1, 1), B(4, 1), C(4, 4), D(1, 4) and the window coordinates are (2, 2), (5, 2), (5, 5) and (2, 5). If the given view port location is (0·5, 0), (1, 0), (1, 0·5) and (0·5, 0·5), then calculate the viewing transformation matrix. *3*

(b) Write the transformation matrix for

(i) Cavalier projection with $\phi = 45^\circ$

(ii) Cabinet projection with $\phi = 30^\circ$ *2*

5. (a) Let P(t) be the Bezier curve defined over the interval [0, 1]. Prove the following :

(i) $P(0) = P_0, P(1) = P_n$

(ii) $P'(0) = n(P_1 - P_0), \; P'(1) = n(P_n - P_{n-1})$

where n is the degree of Bezier curve. $P_0, P_1, \ldots P_n$ are its control points and P' is $dp(t)/dt$. *3*

(b) Write the transformation matrix for rotating a triangle with vertices A(2, 2), B(4, 2) and C(4, 4) about the origin by 90°. *2*
