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MMTE-004

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

M.Sc. (MACS)

Term-End Examination

December, 2015

MMTE-004 : COMPUTER GRAPHICS

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

(Weightage : 50%)

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

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

   (a) Image aspect ratio is the same as its resolution.

   (b) Raster scanning is better than random scanning technique used in display.

   (c) Point (2, 3, 4, 2) given in homogeneous coordinate system is expressed in Cartesian coordinates as (1, 1·5, 1).

(d) The matrix $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -\frac{5}{3} & -\frac{8}{3} \\ 0 & 0 & -1 & 0 \end{bmatrix}$

represents parallel projection.

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

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

(b) Perform a 45° rotation of triangle A (0, 0), B (1, 1), C (5, 2). *3*

(i) about the origin.

(ii) about the point (–1, –1).

3. (a) Write the output obtained from each of the following OpenGL statements.

(i) glRotatef (90, 0, 0, 1)

(ii) glScalef (2, 2, 2)

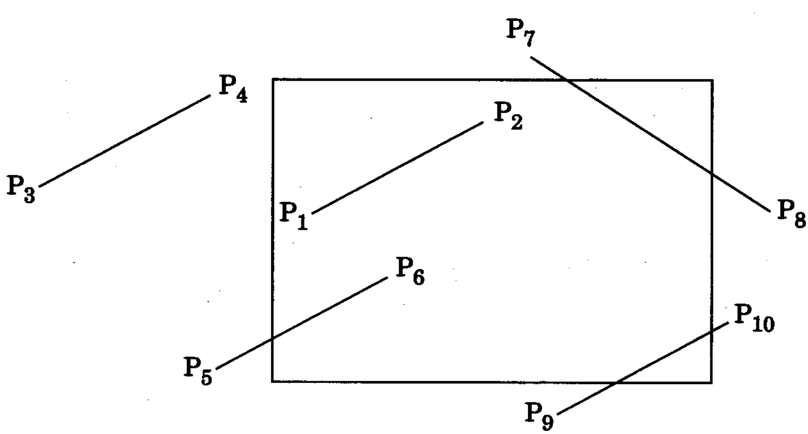
(iii) glTranslatef (1, 0, 0)

Also write the output obtained after executing the statements (i) to (iii). *2*

(b) For a polygon with the vertices V_0 (10, 20), V_1 (20, 0), V_2 (30, 10), V_3 (40, 0) V_4 (40, 40), V_5 (30, 30), V_6 (20, 40), and V_7 (30, 20), prepare an initial sorted edge list and then make the active edge list for scan lines y = 5, 20, 30, 35. *3*

4. (a) Explain Bresenham's line algorithm for a line segment with vertices (5, 4) and (10, 8). *2*

(b) Consider the clipping window and the lines shown in the figure given below. Find the region code for each and also the end points. Identify whether the line is completely visible, partially visible or completely invisible. *3*



5. (a) Use Liang-Barsky line clipping algorithm to clip a line segment with end points (2, 3) and (8, 4) against a clipping window having corners (1, 2), (9, 2), (9, 8) and (1, 8). *2*

(b) Find the equation of the Bezier curve which passes through (1, 1) and (6, 1) and controlled through (2, 3) and (4, 4). *3*
