

00123

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

M.Sc. (MACS)

Term-End Examination

June, 2011

MMTE-004 : COMPUTER GRAPHICS

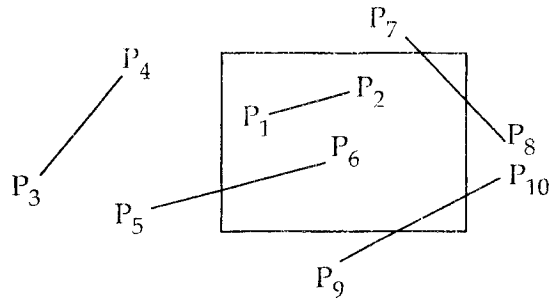
Time : 1½ hours

Maximum Marks : 25

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 with a short proof or a counter example. 2x5=10
- (a) Persistence is the time it takes the emitted light from the screen to decay to one-hundredth of its original intensity.
  - (b) Width of an image having height of 6 inches and an aspect ratio of 1.5 is 8.4 inches.
  - (c) A perspective projection preserves relative proportions.
  - (d) A triangle cannot be mapped to any arbitrary triangle using an affine transformation in general.
  - (e) The result of reflection of a square about  $x$ -axis and then rotation of the resulting square by  $60^\circ$  will be same if the order of transformation is changed.

2. (a) Let  $P(t)$  be the Bezier curve defined over the interval  $[0, 1]$ . Prove the following : 3
- (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,  $p_0, p_1, \dots, p_n$  are its control points and  $p'$  is  $\frac{dP(t)}{dt}$ .
- (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
3. (a) Indicate which raster locations would be chosen by Bresenham's algorithm when scan converting a line from pixel coordinate  $(1, 1)$  to pixel coordinate  $(8, 5)$ . 3
- (b) For a polygon with vertices A  $(50, 0)$ , B  $(50, 60)$ , C  $(0, 40)$ , D  $(10, 10)$ , E  $(20, 30)$  prepare an initial sorted edge list and make the active edge list for scan lines  $y=5, 15$ . 2
4. (a) Consider the clipping window and the lines shown in figure, find the region code for each and also the end point. Identify whether the line is completely visible, partially visible or completely invisible. 3



(b) Write pseudo code to describe DDA algorithm for scan converting a line whose slope is between  $-45^\circ$  and  $45^\circ$ . 2

5. (a) Let origin be the centre of projection. Find out the perspective projection when the projection plane passes through the point  $P(1, 2, 3)$  and has normal vector  $(1, -1, 1)$ . 2

(b) Plot a circle with centre at  $(5, 5)$  having radius of 5 unit using mid-point circle algorithm. 3

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