

# Computer Graphics & Virtual Reality

QP Code : 31109

(2½ Hours)

[ Total Marks : 80

N.B. : (1) Question 1 is compulsory.

(2) Attempt any three questions from the remaining questions.

(3) Assume suitable data wherever applicable.

(4) Draw figures wherever applicable.

1. (a) Differentiate between Raster scan display and Random scan display. 5
- (b) Prove that two successive rotation transformations are additive 5
- (c) Show that the transformation matrix for a reflection about a line  $y = x$  is equivalent to reflection to x-axis followed by counter clockwise rotation of  $90^\circ$ . 5
- (d) Explain 3D trackers & enumerate some important trackers characteristics 5
  
2. (a) Specify highlights and drawbacks of Bezier curve. Construct the Bezier curve of order three with control points  $P_1(0,0), P_2(1,3), P_3(4,2)$  and  $P_4(2,1)$ . Generate at least five points on the curve. 10
- (b) Write DDA Line drawing Algorithm. Compare DDA with Bresenham's Line drawing Algorithm. Calculate the pixel co-ordinates of line Abusing DDA Algorithm where  $A=(0,0)$  and  $B=(4,5)$ . 10
  
3. (a) Let ABCD be the rectangular window with  $A(20,20), B(90,20), C(90,70)$  and  $D(20,70)$ . Find region codes for endpoints and use Cohen Sutherland algorithm to clip the lines  $P_1 P_2$  with  $P_1(10,30), P_2(80,90)$  10
- (b) With respect to 3D transformations, describe the steps to be carried out when an object is to be rotated about an arbitrary axis. Specify all the required matrices. State your assumptions clearly. 10
  
4. (a) Explain Flood Fill Algorithm for 4 connected and 8 connected. What are its advantage over Boundary Fill Algorithm 10
- (b) Explain an algorithm which uses parametric equation of line clipping. Using same algorithm find the line segment  $A(10, 10)$  and  $B(70,40)$  after it is clipped against the window of two vertices  $(20,20)$  and  $(40,50)$ . 10



5. (a) Consider a triangle ABC whose coordinates are A (1 0, 20) B (30, 40) and 10  
8 C (50, 20). Perform the following transformations (Specify the matrices  
that are used)
- (i) Translate the given triangle by 3 units in X direction and -2 units in  
Y direction.
  - (ii) Rotate the given triangle by 30.
  - (iii) Reflect the given triangle about  $X = Y$
  - (iv) Scale the given triangle uniformly by 2 units.
- (b) What is the significance of modeling in virtual reality? Explain any 10  
modeling technique used in virtual reality.
6. Write a short note on (Any five):
- (a) Homogeneous Coordinates. 5
  - (b) Text Clipping. 5
  - (c) fractals 5
  - (d) B- spline curve 5
  - (e) Morphing and warping. 5