

**IV B.Tech I Semester Regular Examinations, November 2005****COMPUTER GRAPHICS****(Computer Science & Systems Engineering)****Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. Explain the construction and functioning of shadow mask-CRT devices. [16]
2. (a) Discuss the steps involved in the ordered edge list algorithm.  
(b) What are the advantages of edge flag algorithm. [8+8]
3. (a) What is meant by homogeneous representation of transformation matrices. Why it is necessary.  
(b) List the homogeneous representation of all the basic transformations.  
(c) Find the transformation matrix that represents rotation of an object by  $30^\circ$  clock wise, about the origin. [5+5+6]
4. (a) Let R be the rectangular window whose lower left hand corner is at L (-3,1) and upper right-hand corner is at R (2,6). Find the end bit codes for the following points.
  - i. A(-4,2)
  - ii. B(-1,7)
  - iii. C(-1,5)
  - iv. D(3,8)  
(b) How do we determine whether a point p(x,y) lies to the left or to the right of a line segment joining the points  $A(x_1, y_1)$  and  $B(x_2, y_2)$ ? [8+8]
5. (a) If tilting is defined as a rotation about a axis followed by a rotation about y-axis in 3-D space, find the tilting matrix.  
(b) Demonstrate that order of performing the rotation matrix for the above problem. [8+8]
6. (a) Show how the calculations of the intersection of an edge with a scan line can be made incremental as opposed to absolute.  
(b) What difficulties are encountered in implementing the painter's algorithm? [8+8]
7. (a) Prove that a Bezier curve in the plane is axis independent.  
(b) Demonstrate that B-spline curve follows local control. [8+8]
8. (a) Explain the role of texturing in realistic image generation.  
(b) How the mapping from texture space to image space is performed in 3-D space. [8+8]

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1. Discuss the construction and functioning of the following input devices:
  - (a) Key board
  - (b) Mouse [8+8]
2. (a) Explain how the area antialiasing technique is implemented?
  - (b) Distinguish between antialiasing and halftoning. [8+8]
3. (a) What is meant by composite transformations
  - (b) Write the general form of a scaling matrix with respect to a fixed point  $P(h,k)$  where the scaling factors in x and y directions are a and b respectively. [6+10]
4. (a) Find the general form of the transformation N which maps a rectangular window with x extent  $xw_{min}$  to  $xw_{max}$  in the x-direction and y extent  $yw_{min}$  to  $yw_{max}$  in the y-direction on to a rectangular view port with x extent  $xv_{min}$  to  $xv_{max}$  and y extent  $yv_{min}$  to  $yv_{max}$ .
  - (b) Distinguish between Cohen-Sutherland outcode and Sutherland-Hodgeman algorithm. [8+8]
5. Distinguish the transformations performed in 2-D graphics and 3-D graphics. Explain how many matrices are needed to define each of the basic transformations. [16]
6. (a) Discuss the steps involved in Gourand shading.
  - (b) What are the limitations of Gourand shading. How to overcome the limitations? [8+8]
7. (a) Discuss about the luminosity function of three primary colors.
  - (b) Briefly discuss about chromaticity diagram. [8+8]
8. (a) Explain the role of texturing in realistic image generation.
  - (b) How the mapping from texture space to image space is performed in 3-D space. [8+8]

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1. Discuss the construction and functioning of the following input devices:
  - (a) Key board
  - (b) Mouse [8+8]
2. (a) Write an algorithm to draw a straight line between two end points using digital differential analyzer (DDA) algorithm.
  - (b) Compute the intermediate points using the DDA algorithm, when the end points of the line are given as (0,0) and (7,4). [8+8]
3. (a) Prove that the multiplication of two successive translation matrices are commutative.
  - (b) Prove or disprove that the reflection operation could be simulated by other basic transformations. [8+8]
4. (a) Explain the line-clipping algorithm using mid-point sub-division approach.
  - (b) How the stack size and length of the line segment are related in the context of mid-point subdivision algorithm?
  - (c) Explain how the visibility test is performed with respect to a given vector. [8+4+4]
5. (a) If P (x, y, z) is an object reference point for scaling, explain how the scaling operation is defined in terms of scaling with respect to the origin.
  - (b) Show that the multiplication of two successive scalings is commutative. [8+8]
6. (a) What is minimax test used in z-buffer algorithm? When the mini-max test fails?
  - (b) In the depth buffer algorithm, how many bits must be allocated to each entry in depth array and inframe buffer. [8+8]
7. (a) State the blending function suitable for Bezier surface and explain the terms involved in it.
  - (b) Demonstrate that Bezier curve is axis independent. [8+8]
8. (a) What is meant by animation? Explain.
  - (b) Discuss the characteristics of key-frame animation. [8+8]

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1. List the operating characteristic of the following input devices.
  - (a) Key board
  - (b) Mouse
  - (c) Track ball and
  - (d) Joy stick. [4×4]
2. (a) Explain how the edge flag algorithm is implemented for plygon filling?  
(b) Distinguish the merits and demerits of different scan line algorithms. [8+8]
3. (a) List the basic transformations which cause the physical distortion in the transformed object.  
(b) An object point  $P(x,y)$  is translated in the direction  $U = aI + bJ$  and simultaneously an observer moves in the direction  $U$ . Show that there is no apparent motion of the object point from the point of view of obsever. [8+8]
4. (a) Let  $R$  be the rectangular window whose lower left hand corner is at  $L (-3,1)$  and upper right-hand corner is at  $R (2,6)$ . Find the end bit codes for the following points.
  - i.  $A(-4,2)$
  - ii.  $B(-1,7)$
  - iii.  $C(-1,5)$
  - iv.  $D(3,8)$  
(b) How do we determine whether a point  $p(x,y)$  lies to the left or to the right of a line segment joining the points  $A(x_1, y_1)$  and  $B(x_2, y_2)$ ? [8+8]
5. Drive the matrix form for the geometric transformations in 3-D graphics for the following operations.
  - (a) Translation
  - (b) Scaling
  - (c) Mirror reflections. [5+5+6]
6. (a) What is minimax text used in z-buffer algorithm? When the mini-max test fails?

- (b) In the depth buffer algorithm, how many bite must allocated to each entry in depth array and inframe buffer. [8+8]
- 7. (a) Write the algorithm for a Bezier surface which forms a convex hull characterized by four control points in X direction and three control points in Y direction. The number of surface points in X and Y directions are 100 and 50 respectively.  
(b) Analyse the computation complexity involved in the above algorithm. [10+6]
- 8. Give a detailed note of the following rules of animation.
  - (a) Slow-in and Slow-out
  - (b) Stage the action. [8+8]

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