5/12/16 (M)
Monday

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1333 **F-7** **Your Roll No.....**

Unique Paper Code : 2341503

Name of the Paper : Computer Graphics

Name of the Course : **B.Tech. Computer Science**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The question paper consists of **two** sections.
3. **Section A** is compulsory.
4. Attempt any **four** questions from **Section B.**

SECTION A

1. (a) Consider a raster system with the resolution of 640 × 480 How many pixels can be accessed per second in this system by a display controller that refreshes the screen at a rate of 60 frames per second ?

   What is the access time per pixel in this system ? (3)

   (b) Cite any two differences between Beam Penetration and Shadow mask CRT. (2)

2. Indicate raster positions that would be chosen in the first quadrant while scan converting a circle of radius 5 centered at origin. (5)

3. (a) Using Cohen Sutherland Line Clipping algorithm, clip the line segment PQ with P(0, 5) and Q(1, 5) by rectangular window defined as A(0, 0), B(1, 0), C(1, 1) and D(0, 1). (3)

P.T.O.

(b) Show that origin is invariant under a general 2 × 2 transformation matrix given below :

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$ (2)

4. (a) A unit square is transformed by 2 × 2 transformation matrix. The resulting position vector are

$$\begin{bmatrix} 0 & 2 & 8 & 6 \\ 0 & 3 & 4 & 1 \end{bmatrix}$$

What is the transformation matrix ? (3)

(b) What is the difference between Cabinet and Cavalier projections ? (2)

5. (a) Write a 3D transformation matrix that scales an object to double its size w.r.t a fixed point (1, 1, 2). Use homogenous coordinates. (3)

(b) Give one advantage and one disadvantage of the Z-buffer algorithm ? (2)

6. (a) Distinguish zero-order, first-order and second-order continuity for polynomial curves. (3)

(b) What is the advantage of Gourad shading over flat shading ? (2)

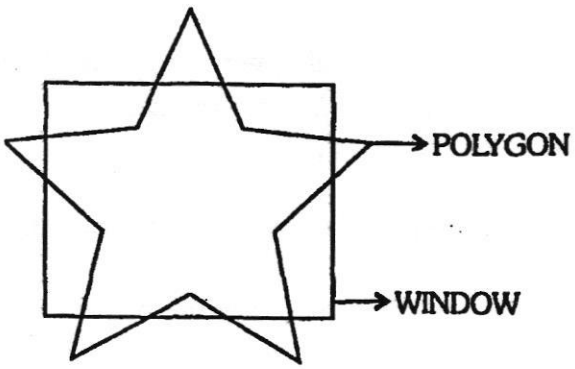
7. (a) What are additive and subtractive color models ? (2)

(b) How do we specify animation sequences using kinematic and Dynamic description ? (3)

SECTION B

8. (a) Write an algorithm to produce a line segment of 3 pixel width using DDA algorithm. (4)

(b) Use Sutherland Hodgeman polygon clipping algorithm to clip the polygon (star shaped) shown below. Label the vertices of the star appropriately. (6)



9. (a) Briefly explain the working of Plasma Panel display. (4)

(b) Consider the polygon with vertices A(2,3), B(7,1), C(11,4), D(11,11), E(7,7), F(2,9). Use scan fill algorithm to fill the polygon till scan line number 8. Show the entries in global edge table and active edge table for every scan line. (6)

10. (a) Find the composite tranformation matrix to reflect the triangle ABC with coordinates A(5,50), B(20,40) and C(10,70) w.r.t to a line passing through the points (10,10) and (0,10). (4)

(b) Derive Dimetric projection matrix where foreshortening of lines along x-axis is equal to foreshortening of lines along z-axis. (6)

11. Write the 3D transformation matrices for the following :

(i) Scale by a factor of 2 along x-axis and 3 along y axis. (1)

(ii) Shear along X-axis given shearing factors 2 and 4 units along Y and Z-axis respectively. (2)

(iii) Rotate about x-axis by 30° w.r.t fixed point (1,2,1,1). (3)

(iv) Two-point perspective projection on X=0 plane with Centre of projection (COP) lying on Z-axis as 2.0 and OP lying along Y-axis as –1.0. Also give the respective vanishing points. (4)

12. (a) Given a cubic B′ezier curve x(t), which is defined by control points p0, p1, p2, p3. Derive the equation x(t) for the tangent of the curve at each value of t. Evaluate x′(0) and x′(1). (5)

(b) Describe the steps required to design an animation sequence. (5)

13. (a) Describe the Area-subdivision algorithm for visible surface determination. (5)

(b) How can we increase the number of intensity levels in a bi-level display ? Explain with the help of an example ? (5)