Sr. No. of Question Paper : 856   E   Your Roll No................

Unique Paper Code   : 234601

Name of the Course   : **B.Sc. (H) Computer Science**

Name of the Paper   : Computer Graphics (CSHT–614)

Semester   : VI

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 two different raster systems with resolutions 640×480 and 1280×1024. What size frame buffer (in bytes) is needed for each of these systems to store 12 bits per pixel ?   (2)

   (b) What is anti-aliasing ? Discuss any one anti-aliasing method.   (3)

2. (a) What is the condition that ellipse scan conversion algorithm uses to divide the first quadrant of the ellipse in two regions ?   (3)

   (b) What are the disadvantages of DDA line drawing algorithm ?   (2)

3. (a) Write the 3D projection matrices for each of the following :

   (i) Orthographic projection on x=0 plane

(ii) Single point perspective projection with centre of projection on y-axis at $y_c = 2$.

(iii) Trimetric Projection matrix.   (1+2+2)

4. Derive the basis matrix for Bezier curve.   (5)

5. Discuss Depth sorting method for hidden surface elimination. What tests are performed when there is depth overlap ?   (5)

6. (a) Write steps to design an animation sequence.   (2)

   (b) What is Dithering ? What is its advantage over halftoning ?   (3)

7. Derive the illumination using Phong specular-reflection model. Include the contribution of diffuse, ambient and specular reflection.   (5)

SECTION B

8. (a) Explain Shadow mask and beam penetration methods used in raster scan systems to display colors.   (4)

   (b) Indicate which raster locations would be chosen by Bresenham's algorithm when scan-converting a line from screen coordinate (1,1) to screen co-ordinate (8,5).   (6)

9. (a) Differentiate between Phong and Gouraud shading models.   (4)

   (b) Consider a polygon ABCDE; A(2,3), B(7,3), C(7,17), D(4,7), E(2,10). Use Scan line fill algorithm to fill the polygon till scan line 8. Show the global edge table and active edge table at each step.   (6)

10. (a) Show that a 2D reflection through the x-axis, followed by a 2D reflection through the line y=x, is equivalent to a pure rotation about the origin.   (4)

  (b) A clipping window has two vertices lying at (0,0) and (80,40). Use the line end point codes to determine whether the lines P(40,20), Q(70,50) and R(100,20), S(120,60) would be visible , partially visible or totally invisible.   (4)

  (c) What is RGB color model ? How RGB model represented ?   (2)

11. (a) Give the 3D homogeneous matrix for each of the transformations in parts i-iii. :

    (i) Scale in the x-dimension by 2 and the y-dimension by 3 with fixed point (4,2,2)

    (ii) Rotate by 30 degrees about the x-axis.

    (iii) Reflect about the Y-axis.   (3+2+2)

  (b) Consider a line AB parallel to Z-axis with end-points A[3 2 4 1] and B[3 2 8 1]. Perform perspective projection onto z=0 plane with the centre of projection at Z_c= 2.0.   (3)

12. (a) Find the equation of the Bezier curve that passes through (0, 0) and (4, 2) and controlled through (14,10) and (4, 0).   (5)

  (b) Write the pseudo code for Z-buffer Visible surface determination algorithm ? What are its advantages and disadvantages ?   (5)

13. (a) What are trace points ? How are they different from principal vanishing points ?   (2)

(b) How do we simulate acceleration in any animation ? Describe how the frame spacing controls the motion simulated in an animation scene ? (4)

(c) A triangle is defined by vertices (2,0),(0,2),(–2,0). It is transformed by the 2×2 transformation matrix :

$$T = \begin{bmatrix} 6 & 4 \\ 2 & 4 \end{bmatrix}$$

Find the area of transformed triangle. (4)