

7th Semester Examination 2012

Department of Computer Science and Technology

Bengal Engineering and Science University, Shibpur

Subject: Computer Graphics

paper: CS 701

Time: 3hr

Full Marks: 70

Answer any four questions taking two from each half

All questions carry equal marks, two numbers for to the point answer

FIRST HALF

1. Show the symmetric points corresponding to point (x, y) on a circle. How do they help in scan conversion of a circle of radius r centred at (a, b) ? What are the shortcomings of scan conversion methods? How to tackle such problems to get more realistic display?
2+6+4+5
2. Derive the transformation matrices to shift coordinates along either X or Y-axis considering origin and $(x_{ref}$ and $y_{ref})$ are two different reference points. Given a unit cube with one corner at $(0, 0, 0)$ and the opposite corner at $(1, 1, 1)$, derive the transformations necessary to rotate the cube by θ degrees about the diagonal in the counterclockwise direction when looking along the diagonal toward the origin. What do you mean transformation as a change of coordinate system?
5+8+4
3. We have a rectangular window defined by vertices $(0,0)$, $(8,0)$, $(8,4)$ and $(0,4)$. Clip a line with end points $(1,1)$ and $(7,2)$ using Liang–Barsky parametric line clipping algorithm. How parametric clipping method is computationally efficient than nonparametric methods? Explain why the Sutherland-Hodgman Polygon Clipping algorithm works for only convex polygon clipping regions.
8+4+5
4. How does geometric continuity help in designing smooth curves? What is convex hull? Write an algorithm for generating Bezier curves using four control points. What are the drawbacks of Beizer curves?
4+4+6+3

SECOND HALF

5. Write a procedure to determine a seed pixel for filling a polygon. The coordinates of a polygon ABCDEFGH are A(2, 4), B(9, 4), C(9, 7), D(8, 7), E(8, 9), F(4, 9), G(4, 7) and H(2, 7). Find out the edges that will form active list on scan lines $y = 6, 7, 8, 9$ and 10. What way active edge list helps to real time scan conversion of polygons?

3+10+4

6. Consider a unit cube in the standard position with its vertices at A(0,0,0), B(1,0,0), C(1,1,0), D(0,1,0), E(0,1,1), F(0,0,1), G(1,0,1) and H(1,1,1). Perform a trimetric projection of the cube when the view direction is along the negative Z-axis. Consider the rotation angles 30° and 60° about Y and X-axes respectively. What are the differences between perspective and parallel projection? Derive transformation matrix for perspective projection.

6+5+6

7. Write Z-buffer algorithm. Mention coherence property useful to improve the efficiency of the algorithm. Write properties of B-spline curve. Describe one object space method for removing hidden surface.

4+4+4+5

8. Short notes: Painter's Algorithm, Hermite cubic spline, Concave polygon clipping, Classification of projection techniques.

4+4+5+4