

**S.E. (Comp. Engg.) EXAMINATION, 2009**

**COMPUTER GRAPHICS**

**(2003 COURSE)**

**Time : Three Hours**

**Maximum Marks : 100**

- N.B. :—** (i) Answers to the two Sections should be written in separate answer-books.  
(ii) Neat diagrams must be drawn wherever necessary.  
(iii) Figures to the right indicate full marks.  
(iv) Assume suitable data, if necessary.

**SECTION I**

1. (a) Explain in detail Bresenham's incremental circle generation algorithm with the help of necessary derivation and explain how the algorithm is generalized for other quadrants. [8]  
(b) Define the following terms : [4]  
(i) Persistence  
(ii) Resolution  
(iii) Aspect ratio  
(iv) Raster scan display.  
(c) Explain black and white frame buffers and color frame buffer. [6]

*Or*

2. (a) Explain postfiltering and simple area antialiasing in detail. [8]  
(b) Explain flat panel displays in detail. [6]  
(c) Write a short note on "text and line style". [4]

3. (a) Discuss the merits and demerits of real time scan conversion and run length encoding. [8]  
(b) Write an algorithm for edge-fill polygon filling. [8]

Or

4. (a) Show how shear transformations may be expressed in terms of rotations and scales. Show how rotations can be expressed in terms of shears and scales. What scaling operations can be expressed as shear ? [8]  
(b) State the characteristics of scan line polygon fill algorithm and compare it with boundary fill algorithm. [8]
5. (a) Write algorithm for the following : [8]  
(i) Change the visibility attribute of a segment  
(ii) Delete a segment  
(iii) Delete all segments.  
(b) Use Cohen-Sutherland outcode algorithm to clip two lines  $P_1(40, 15) - P_2(75, 45)$  and  $P_3(70, 20) - P_4(100, 10)$  against a window  $A(50, 10), B(80, 10), C(80, 40), D(50, 40)$ . [8]

Or

6. (a) Give the segment table structure and explain various data structures used to implement the segment table. [8]  
(b) Explain generalized clipping in detail. [8]

## SECTION II

7. (a) Describe the role of the following parameters in 3D viewing process : [10]  
(i) Reference point  
(ii) Line of sight  
(iii) Clipping planes.

- (b) Derive the 3D transformation matrix for the following : [8]
- (i) Rotation about and arbitrary axis
  - (ii) Reflection about different planes.

*Or*

8. (a) Explain ways of projecting 3D objects onto 2D screen in detail. [8]
- (b) A cube is defined by 8 vertices : [10]  
A(0, 0, 0), B(2, 0, 0), C(2, 2, 0), D(0, 2, 0), E(0, 0, 2)  
F(0, 2, 2), G(2, 0, 2), H(2, 2, 2)  
Perform the following transformations on the above cube :
- (i) Translation ( $t_x = 2, t_y = 4, t_z = 0$ )
  - (ii) Scaling ( $s_x = 0.5, s_y = 1, s_z = 1$ )
  - (iii) Reflection about planes.
9. (a) Explain depth buffer algorithm for visible surface detection in detail. State its advantages and disadvantages. [8]
- (b) Write short notes on the following : [8]
- (i) Ray tracing
  - (ii) Transparency
  - (iii) Shadows.

*Or*

10. (a) Explain CIE chromaticity diagram, also explain how RGB to CMY conversion is done. [8]
- (b) Explain the Painter's algorithm for hidden surface removal. Why Painter's algorithm is a priority algorithm ? [8]

11. (a) Obtain the curve parameters for drawing a smooth Bezier curve for the following control points : [8]  
A(0, 0), B(10, 40), C(70, 30), D(60, -20).
- (b) Explain how fractal line algorithm can be used for generating fractal surface. [8]

*Or*

12. (a) What is interpolation ? Explain Lagrangian interpolation method. [8]
- (b) Define fractal, fractal dimension. [2]
- (c) Write a short note on Triadic Koch Curve. [6]