

Your Roll No.....

1957

B.Sc. (H) Computer Sci./VI Sem. C

Paper—603 : Computer Graphics

Time : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any four questions from Section B.

Section A

1. (a) Differentiate between raster scan and random scan systems.

(b) What is the condition that the ellipse scan conversion algorithm uses to divide the first quadrant of the ellipse into two regions.

2. (a) Briefly explain the z-buffer algorithm for visible surface detection. 4
- (b) Discuss the characteristics of key-frame animation. 3
3. (a) Give the structure of global edge table and active edge table used in scan line fill algorithm. 4
- (b) Show that parallel lines remain parallel after transformation. 3
4. (a) Derive the 3d homogeneous transformation matrix to rotate an object about a line parallel to y-axis. 3
- (b) Explain the intensity interpolation scheme for polygon rendering. What is its drawback? 4
5. (a) Write the geometric vector used to define a : 4
- (i) Hermite curve, and
- (ii) Bezier curve.
- (b) Define the following : 3
- (i) Halftoning
- (ii) Dithering
- (iii) Look up table.



## Section B

6.

(a) How long would it take to load a  $640 \times 480$  frame buffer with 12 bits per pixel, if 105 bits can be transferred per second. 3

(b) Calculate points on a line from (0, 0) to (4, -8) using Bresenham's line drawing algorithm. 7

7. (a) Briefly explain the working of a Liquid Crystal Display. 3

(b) What are the merits and demerits of storing and generating characters using bitmap method? Give the structure of a bitmap font cache. 4

(c) Briefly explain any one basic method to draw thick primitives with its advantages and disadvantages. 3



8. (a) Let  $R$  be a rectangular window whose lower left corner is at  $L(-3, 1)$  and upper right-hand corner is at  $R(2, 6)$ . If the line segment is defined with two end points with  $A(-4, 2)$  and  $B(-1, 7)$  :

- (i) The region codes of the two end points
- (ii) Its clipping category and
- (iii) Stages in the clipping operations using Cohen-Sutherland algorithm. 6

- (b) Write steps to fill a polygon using scan line fill algorithm. 4

9. (a) Show that the composition of two rotations is additive that is : 3

$$R(\alpha) * R(\beta) = R(\alpha + \beta).$$

- (b) Magnify the triangle with vertices  $A(0, 0)$ ,  $B(1, 1)$  and  $C(5, 2)$  to thrice its size while keeping  $B(1, 1)$  fixed. Use homogeneous coordinates. 4

*Ans* (c) What are rigid body transformations ? Discuss the property of transformation matrix, which would give rigid body transformation. 3

10. (a) What are vanishing points ? How are they obtained in perspective projection ? 3

(b) Give  $4 \times 4$  homogeneous-coordinate transformation matrix which will have the same effect as each of the following transformation :

(i) Rotate counter clockwise about x-axis and then translate up by 2 units. 2

(ii) Overall reduce the size of object to half. 2

*Q* (iii) Apply two point perspective projection on  $z = 0$  plane with center projections on x-axis and y-axis given as  $(1, 0, 0)$  and  $(0, -2, 0)$ . 3



11. (a) Derive the basic matrix for a Bezier curve ? Write any two properties of Bezier curve ? 5
- (b) How do we simulate acceleration in key frame systems ? 3
- (c) List any four logical input-device classifications used by the graphics systems. 2

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