This question paper contains 4+2 printed pages]

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. 4

(*b*) What is the condition that the ellipse scan conversion algorithm uses to divide the first quadrant of the ellipse into two regions. 3

P.T.O.

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 tranformation 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 × 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 Bresenhams 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

(*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 × 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

(*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