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Your Roll No. .....

1805 **A**

B.Sc. (H) Computer Sci./VI Sem.
Paper—603 : Computer Graphics
(Admissions of 2001 and onwards)

Time : 3 *Hours* *Maximum Marks* : 75

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

Attempt all questions.

1. (a) If a screen has 513 scan lines and an aspect ratio of 3:4, and if each pixel contains 8 bits worth of intensity information, how many bits per second are displayed if 30 frames are displayed per second ? 3

   (b) Discuss the working of impact and non-impact printers with examples. 3

   (c) Briefly explain the interlaced refresh procedure in a raster scan system and its advantage. 3

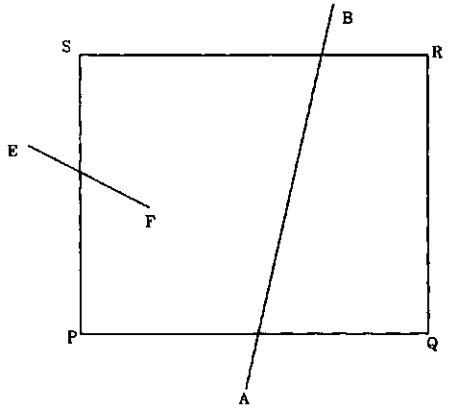
   (d) What is aliasing? How can the effects of aliasing be minimized? 4

[P.T.O.

2. (a) Indicate which raster locations would be chosen by Bresenham's algorithm when scan-converting a line of thickness 3 from screen coordinate (1,1) to screen co-ordinate (8,5). 6

(b) Enumerate the steps for scan line polygon fill algorithm. Also, list the data structures used. 5

(c) Consider the following Clip Rectangle PQRS and lines AB and EF:



Assume P(5,5) and R(15,15), E(3,13), F(7,11), A(10,3) and B(12,18).

Answer the following questions:

(i) Compute the region codes for line AB using Cohen and Sutherland Line clipping algorithm. 2

(ii) Using Liang Barsky Line Clipping algorithm, Compute the value of the parameter (t) at which EF intersects the edge PS and classify it as entering point or leaving point with respect to the rectangle PQRS. 4

(d) Draw a flowchart for the logic of Sutherland-Hodgeman polygon clipping algorithm. Hence, illustrate the working with the help of a suitable example. 6

3. (a) Give the transformation matrix for each of the following transformations :

(i) Scale in the X-dimension by 2 and y-dimension by 3 with respect to fixed point (4,2). 2

(ii) Rotate by – 30° about the point (– 2,3). 2

(iii) Reflect about the line y = – 5. 3

(Use Homogenous coordinates sin (– 30)= ⁻ ½ and cos (– 30) = $\sqrt{3}/2$)

(b) Prove that parallel lines remain parallel after transformation. 3

(c) Consider a 3D object X with the position vectors given below :

$$X = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

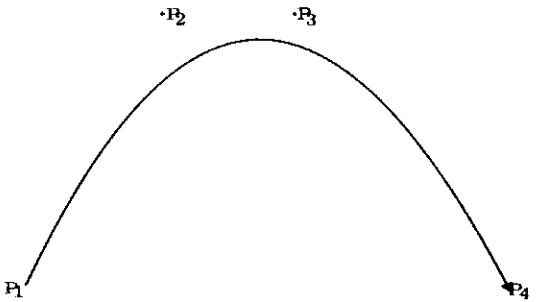
(i) Obtain a covalier projection for X, choosing horizontal angle as 30°. 3

(ii) Obtain a single point perspective transformation for X with centre of projection x_c = (– 10, 0, 0) projected onto $y = 0$ plane. Also indicate the vanishing point. 4

[P.T.O.

4. (a) Obtain the blending function for hermite curve . 3

(b) Given the following Bezier curve defined by four control points P_1, P_2, P_3, and P_4 divide it into two curve segments in the ratio 1 : 1. 3



(c) Describe an algorithm that, gives a grayscale image, will produce a black and white (bi-level) image of four times the resolution in each dimension which provides a good approximation to a grayscale image. 4

5. (a) Explain the depth buffer method in image space to detect visible surfaces of an object. 4

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

(c) Explain the Gourad shading scheme for polygon rendering. What is its drawback? 4