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**B. TECH.**

SIXTH SEMESTER EXAMINATION, 2003-2004

**COMPUTER GRAPHICS**

Time : 2 Hours

Total Marks : 50

**Note :** Attempt **ALL** the questions.1. Answer any **FOUR** of the following parts :— (3×4=12)

- (a) Explain the concept of working of Interactive Computer Graphics with suitable example.
- (b) Suppose you have a system with an 8-inch by 10-inch video monitor that can display 100 pixels per inch. If memory is organized in one byte words, the starting frame-buffer address is 0 (zero), and each pixel is assigned one byte of storage, what is the frame-buffer address of the pixel with screen coordinates  $(x, y)$  ?
- (c) Find out raster locations (pixels) which would be chosen by Bresenham's algorithm for line drawing from screen coordinates  $(1, 1)$  to screen coordinates  $(8, 5)$ .
- (d) Suppose we have a computer with 32 bits per word and a transfer rate of 1 mip (one million instructions per second). How long would it take to fill the frame-buffer of a 300 dpi (dot per inch) laser printer with page size of  $8\frac{1}{2}$  inches by 11 inches ?

- (e) Write a line-type procedure by modifying Bresenham's line drawing algorithm to display either solid, dashed or dotted or dotted lines.
- (f) Explain simple DDA line drawing algorithm in detail. Implement the simple parity polygon scan conversion.

2. Attempt any FOUR of the following :— (3×4=12)

- (a) What is Segmentation ? Give an example of a Segmentation Table.
- (b) How can you create, delete and rename a segment ?
- (c) What is a Matrix ?

Given :

$$A = \begin{bmatrix} 7 & 3 & -1 \\ 2 & -5 & 6 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 5 & 6 \\ -11 & -2 & 3 \end{bmatrix}$$

Find (i)  $A + B$  (ii)  $A - B$ .

- (d) Explain the transformation routines of a matrix with an example.
- (e) What is the difference between a window and a view port ? Explain with a sketch.
- (f) For the interval defined by a set of points  $x$  such that  $x \in [-2, 5]$ , determine if the following points are inside, outside or on boundary :

(i) 4 (ii) 7 (iii) -2

3. Attempt any TWO of the following :— (6×5×2=13)

- (a) Explain the use of homogeneous coordinates in Computer Graphics for representing transformation in 3-dimensional space.

Also, define identity transformation and inverse transformation.

- (b) Name three common hardware input devices. Explain, briefly, input device handling algorithm.
- (c) Name three physical interactive devices. Explain the working principle of a joystick.

4. Attempt any TWO of the following :— (6.5×2=13)

- (a) Construct enough points on the Beizer curve whose control points are  $P_0(4, 2)$ ,  $P_1(8, 8)$  and  $P_2(16, 4)$  to draw an accurate sketch.
  - (i) What is the degree of the curve ?
  - (ii) What are the coordinates at  $u = 0.5$  ?
- (b) What is the back face removal algorithm ? Explain with a sketch. State its limitations.
- (c) In parametric representation of curves, there are methods by which curves can be represented. Define and compare any three of the following :—
  - (i) Hermite Interpolation
  - (ii) Beizer Curve
  - (iii) B. Spline
  - (iv) NURBS