2021

COMPUTER SCIENCE — HONOURS

Paper : SEC-A-1

(Computer Graphics)

Full Marks : 80

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.*** **1** and ***any four*** from the rest.

1. Answer ***any ten*** questions : 2×10

(a) How is spatial interpolation different from temporal interpolation?

(b) When can a series of transformation be termed as commutative?

(c) What are the three basic parts of a display system?

(d) What is a true colour system?

(e) What is the fundamental difference between the mode of operation of a monochrome CRT and a coloured CRT?

(f) How is colour depth and resolution of an image are related to video memory requirement?

(g) What feature of the liquid crystal material is used to produce image in LCD display system?

(h) What do you mean by refreshing a frame and what is the reason behind?

(i) Name the 3 major components present inside a CRT.

(j) What is perspective projection?

(k) Differentiate between interior clipping and exterior clipping.

(l) What is Affine transformation?

(m) Define resolution.

(n) What are keyframes in context to animation?

2. (a) Why is refreshing needed for a steady display? Explain.

(b) Write a short note on Plasma Monitor display system.

(c) Clip a line A (3, 20), B (13, 3) against rectangular window (5, 5) and (25, 15). Use Cohen Sutherland clipping algorithm to solve the problem. 5+5+5

3. (a) What do you mean by transformation in context to Computer Graphics? Why is translation known as 'rigid body transformation'?

(b) Find the transformation that converts a square with diagonal vertices (0, 3) and (–3, 6) into a unit square at the origin.

(c) What is the difference between parallel and perspective projection? 5+5+5

4. (a) Derive and discuss Bresenham's line drawing algorithm.

(b) Implement the Bresenham's line drawing algorithm to draw a line from (4, 4) to (–3, 0).

(c) What is a frame buffer? Differentiate between the feature of the frame buffer as used in Raster Scan and Random scan display system respectively. 5+5+5

5. (a) What are the basic principles behind reflection transformation?

(b) Derive the transformation matrix for reflection considering the straight line Y = – X as the mirror line.

(c) What is pure reflection?

(d) What is shear? Write the transformation matrix for shear transformation with respect to X direction and Y direction shear. 3+5+2+5

6. (a) Consider an object ABC with co-ordinates A (1, 1), B (10, 1) and C (5, 5). Rotate the object by 90º in counter clockwise direction about the point A. Give coordinates of transformed object.

(b) Write a short note on beam penetration method used in colour CRT monitors.

(c) Write briefly about the two different types of retrace techniques used in Raster Scan display system. 5+5+5

7. (a) Write a short note on interlaced display system.

(b) How is the intensity of the electron beam controlled inside a CRT?

(c) Define scaling transformation. Differentiate between uniform scaling and differential scaling. 5+5+5

8. (a) Formulate the transformation matrix M which reflects an object about a line L whose Y intercept is (0, b) and an angle of inclination 0º with respect to X axis.

(b) Consider a △ PQR with coordinate values P (10, 40), Q (40, 40), R (40, 30). What will be the transformed coordinate values if the 2D axis is rotated by 45º in anticlockwise direction and translated by 2 units in positive X direction and 1 unit in positive Y direction.

(c) Differentiate between cavalier projection and cabinet projection. 5+5+5