

**2022**

**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) Mention the fundamental difference in the method of operation of a monochrome CRT and a colour CRT.
  - (b) Define aspect ratio.
  - (c) Write down the working principle of shadow mask method of coloured CRT display system.
  - (d) What is an animation?
  - (e) What is affine transformation?
  - (f) Why is inverse transformation needed?
  - (g) Differentiate between interior clipping and exterior clipping.
  - (h) What is persistence?
  - (i) What is a frame buffer?
  - (j) Define window port and view port in computer graphics.
  - (k) What is shear transformation?
  - (l) What do you mean by vanishing point?
  - (m) Differentiate between bitmap and pixmap.
  - (n) Write down 3D rotation about x-axis.
2. (a) Discuss the concept of 8-way symmetry while drawing a circle.  
(b) Derive and write midpoint-circle drawing algorithm.  
(c) Magnify the triangle A (0, 0), B (1, 1), C (5, 2) to twice its size while keeping C (5, 2) fixed.

3+(4+3)+5

**Please Turn Over**

3. (a) Derive and discuss the DDA line drawing algorithm.  
(b) Compare the advantages and disadvantages of Bresenham's line drawing algorithm with those of the DDA algorithm.  
(c) Find the pixels to draw a line from (3, 2) to (8, 4) using DDA. 5+6+4
4. (a) Why are homogeneous co-ordinates used for transformation computations in computer graphics? Discuss clearly.  
(b) Derive the transformation matrix to rotate a point P(a, b) with respect to a line L using homogeneous coordinate system.  
(c) Differentiate between parallel and perspective projection with a suitable example. 5+5+5
5. (a) Describe the steps to design an animation sequence with an example.  
(b) What is morphing? Describe three applications of morphing.  
(c) Differentiate between Raster Scan and Vector Scan display system. 5+(2+3)+5
6. (a) A clipping window ABCD is specified as A (0, 0), B (40, 0), C (40, 40), D (0, 40). We want to clip two lines PR where P (-20, 70), Q (20, 30), and line RS where R (50, 10), S (70, 70) against the window. Use the end point codes of the lines to find out if the lines are totally invisible or partially visible. Use a standard clipping algorithm to find visible portions of the lines.  
(b) Discuss Sutherland Hodgeman polygon clipping algorithm with an example. 10+5
7. (a) Write and explain the Cohen-Sutherland algorithm for line clipping.  
(b) Given a clipping window (bottom left (10, 5), top right (25, 20)), determine the intersection point of the line segments L1((5, 1), (30, 20)) and L2((23, 25), (13, 15)). 5+(5+5)
8. (a) What is meant by composite transformations? Prove that two successive rotations about the origin are commutative.  
(b) Show that the transformation matrix for a reflection about the line  $y = x$  is equivalent to a reflection relative to the  $x$ -axis followed by a counter clockwise rotation of  $90^\circ$ .  
(c) Find the coordinates after rotating the triangle ABC  $45^\circ$  with respect to A, where A (2, 0), B (6, 0) and C (2, 5). (2+3)+5+5
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