

C10-R3: COMPUTER GRAPHICS & ANIMATION

NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

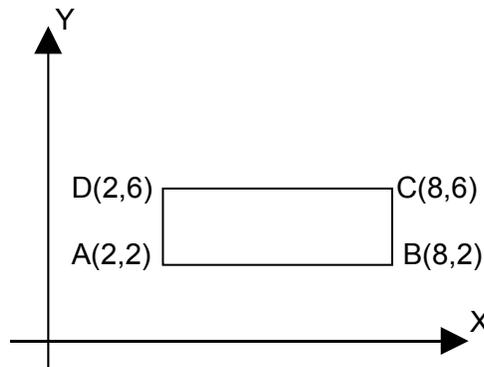
1.

- a) Explain the relationship between the rotations R_θ , $R_{-\theta}$ and R_θ^{-1} .
- b) What are the advantages of the ray tracing method?
- c) Explain the advantages of B-splines over Bezier splines.
- d) Describe the transformation M_L that reflects an object about a line L .
- e) Explain the shape interpolation.
- f) What is the Euler angle representation?
- g) Explain the special effect morphing in computer animation.

(7x4)

2.

- a) Consider a rectangle ABCD in the given figure. Apply the following transformations on rectangle ABCD:
 - i) Rotate the rectangle ABCD with 90 degree in clockwise direction with respect to the point (2,2).
 - ii) Magnify the rotated figure twice to its size in X-direction and half to its size in Y-direction keeping point A (2,2) as fixed point.



Find out the composite transformation matrices to perform the given transformations. Also show output and input matrices.

- b) Describe the Sutherland Hodgman polygon clipping algorithm.

(9+9)

3.

- a) Find the perspective projection onto the view plane $Z=d$ where the centre of projection is the origin (0, 0, 0).
- b) What is temporal aliasing? What types of problem does it pose when you are animating 3D objects having a time dimension?

- c) For the given $B_0[1,1]$, $B_1[2,3]$, $B_2[4,3]$ and $B_3[3,1]$ the vertices of a Bezier polygon. Determine points on the Bezier curve at $t = (0.15, 0.5, 0.85)$.

(6+6+6)

4.

- a) Explain the constructive solid geometry method of solid modeling.
- b) How does the Z-buffer algorithm determine Hidden Surfaces?
- c) Given points $P_1(1, 2, 0)$, $P_2(3, 6, 20)$, $P_3(2, 4, 6)$ and a viewpoint $C(0, 0, -10)$, determine which points obscure the others when viewed from C.

(6+6+6)

5.

- a) Describe the methodology for converting RGB color parameters to HSV values.
- b) How many intensity levels can be displayed with halftone approximations using n by n pixel grids where each pixel can be displayed with m different intensities?

(8+10)

6.

- a) Describe the Phong shading model. What are its advantages and disadvantages over Gourad Shading model?
- b) Discuss with an example, how a visible surface detection method can be combined with an intensity model for displaying a set of polyhedrons with opaque surfaces.

(8+10)

7.

- a) Describe the steps required in a designing of animation sequences.
- b) Design a story board layout and accompanying key frames for an animation of a single polyhedron. How will you expand this to include two or more moving objects?

(9+9)