

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

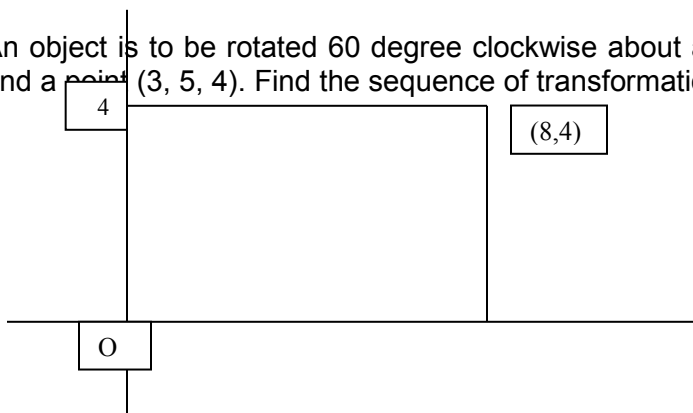
1.
 - a) Describe how the Cyrus-back algorithm determines whether a point on a line is inside, on or outside a window?
 - b) Define the
 - i) one-point perspective transformation
 - ii) two-point perspective transformation and
 - iii) three-point perspective transformation. Can multiple faces of an object be revealed using the perspective projections?
 - c) What are hidden surface problems? How z-buffer algorithm handles them?
 - d) Give any one technique to determine the direction of the reflection vector in implementing an illumination model.
 - e) Discuss the generation of Solid Objects using sweep method.
 - f) Why do we consider a mathematical spline model using cubic polynomials? Whether Bezier curves are better than the routine curve fitting techniques for ab initio design of curves?
 - g) How far a fixed angle representation avoids the invalid representation problem? What is gimbal lock? State the Euler angle representatio.

(7x4)

2.
 - a) Using Cyrus-back algorithm determine whether the line from P(6, -2) to Q(10, 1) will be visible , partially visible or invisible when clipped to the rectangular window as shown below:

- b) An object is to be rotated 60 degree clockwise about an line passing through the origin and a point (3, 5, 4). Find the sequence of transformations required to perform this task.

(10+8)



3.

- a) What are the methods for degree raising of B-spline curves?
Consider an open third-order B-spline curve initially defined by four polygon vertices A(0,0), B(1,1), C(2,1), D(3,0). Subdivide the curve applying Oslo algorithm while maintaining a open uniform knot vector.
- b) Calculate the five third order B-spline basis functions using the knot vector $X = [0 \ 0 \ 0 \ 1 \ 1 \ 3 \ 3 \ 3]$ which contains an interior repeated knot value.

(12+6)

4.

- a) Consider the rectangle with corners as P(10,5,10), Q(10,25,10), R(25,25,10), S(25,5,10) and the triangle ABC penetrating the rectangle from the behind where A=(15, 15, 15), B=(25, 25, 5) and C=(30, 10, 5). Assume the observer is located at infinity on the positive z-axis. If the ray is considered through the pixel at (20, 15), find the visible portion of the scene illustrating each step of the ray-tracing algorithm.
- b) Find the general form of an oblique projection onto the xy plane.

(12+6)

5.

- a) Explain how Octrees can be used to represent curved objects. Give algorithms for union and intersection of object representation using Octrees.
- b) Explain phong's shading model. Give its advantages and disadvantages over Gouraud's model.

(10+8)

6.

- a) What are different techniques used for implementing key frame based animation? Discuss the advantages and disadvantages of them.
- b) Describe the two-pass procedure to interpolate the image grids and forming an in between grid while interpolating one image into another.

(9+9)

7.

- a) Explain and compare the Particle System and Flocking System techniques for animation?
- b) What are the main forces at work in keeping a bunch of boids behaving like a flock. Discuss each of them briefly.

(8+10)