

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 why the Sutherland-Hodgman polygon-clipping algorithm works for only convex clipping regions.
 - b) Describe the transformation M_L that reflects an object about a line L.
 - c) Show the use of velocity curves for carrying out motion control during animation.
 - d) What is the maximum number of objects that can be represented using the Z buffer algorithm? What will happen when two polygons have the same Z value?
 - e) Describe the advantages of representing an object using Octree. Compare it with BSP tree representation.
 - f) Explain the special visual effect morphing in graphics animation.
 - g) Mention the problems of Gouraud shading and tell how far they are solved using phong shading? Can these two shading method be used effectively in animation sequences?
(7x4)

2.
 - a) The matrix $\begin{matrix} 1 & a \\ b & 1 \end{matrix}$ define a transformation called a simultaneous shearing.
Interpret the cases (i) $b = 0$ (ii) $a = 0$
Illustrate the effect of these shearing transformation on the square whose vertices are A(0,0), B(1,0), C(1,1,) and D(0,1) when $a = 2$, $b = 3$. Comment on the result of above transformation.
 - b) Write a program to display the visible surfaces of a convex polyhedron using the BSP-tree method.
 - c) Set up an algorithm to load a given Quad tree representation for an object into a frame buffer for display.
(6+6+6)

3.
 - a) Discuss how the various visible – surface detection methods can be modified to process transparent objects. Are there any visible – surface detection methods that cannot handle transparent surfaces?
 - b) Given a spherical surface, write a bump – mapping procedure to generate the bumpy surface of an orange.
 - c) Describe Gouraud shading model for rendering a polygon surface.
(6+6+6)

4.
 - a) Explain Morphing. Describe the procedure to obtain two connected line segments in a key frame K + 1 by transforming a line segment in key frame K using linear interpolation.
 - b) Describe the forward and inverse kinematics and their use in animation.
 - c) How many types of Boolean operations can be performed on the 3D objects represented by Octrees.
(6+6+6)

- 5.**
- a) Describe the method to construct animation sequence using kinematics.
 - b) What main considerations are applied in displaying the motion?
 - c) Name the general stages used in a three dimensional transformation of pipeline process for displaying the world coordinate system. Give the input and output corresponding to each block.
- (6+6+6)**

- 6.**
- a) Describe the full procedure for the simulation of particle generation.
 - b) Explain the modeling of fire and cloud situations.
 - c) Write a morphing program to transform a sphere into a specified polyhedron.
- (6+8+4)**

- 7.** Write short notes on:
- a) Polygon clipping.
 - b) Spline curve using forward difference scheme.
 - c) Collision detection.
- (6+6+6)**