

C10-R3: COMPUTER GRAPHICS AND 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

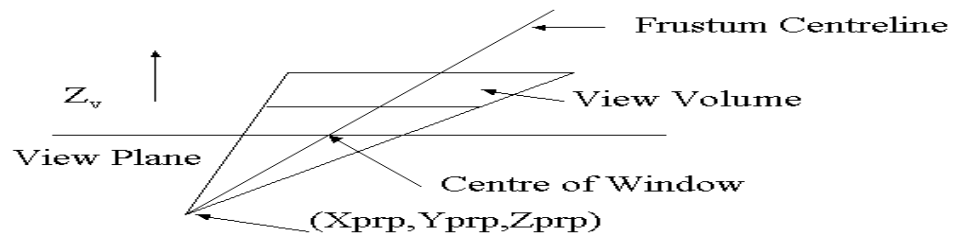
1.
 - a) What is aliasing? What is Nyquist's sampling frequency and its usage in reference to aliasing?
 - b) Give the Bresenham's Line Drawing Algorithm for $|m| < 1$.
 - c) What is depth cueing? Explain with example.
 - d) What are BSP trees and how are they compare with Octrees.
 - e) How can the snowflake pattern be constructed?
 - f) How is texture mapped onto surface of objects? What is bump mapping?
 - g) What is morphing? How can a triangle be wrapped to a quadrilateral?

(7x4)

2.
 - a) Explain how Cohen Sutherland Line Clipping Algorithm works.
 - b) Prove that the multiplication of transformation matrices for each of the following sequence of operations is commutative:
 - i) two successive rotations.
 - ii) two successive translations.
 - iii) two successive scaling.

(9+9)

3.
 - a) Give a simple perspective model corresponding to a pinhole camera, for a perspective projection of a scene from the world frame to an image in the retinal plane.
 - b) How can the general perspective projection for the following diagram be obtained?



(8+10)

4.

- a) What are meant by Interpolation and Approximation Spline? What is the significance of zero, first and second order parametric or geometric Continuity.
- b) Give the properties of Bezier Curves. Write the four Blending functions and zero, first and second parametric derivatives for Cubic Bezier Curve.

(9+9)

5.

- a) How does hidden surface elimination takes place when an Octree representation is used for viewing volume.
- b) What are meant by diffuse and specular reflection? For a single point source of light, how can the combined diffuse and specular reflections be modeled from a point on an illuminated surface?

(8+10)

6.

- a) How is a transparent surface modeled? What is Snell's law?
- b) Give the matrix model to represent the motion of scene points and the motion of camera.

(9+9)

7.

- a) What is meant by kinematics, inverse kinematics and dynamics of motion specification in animation sequences?
- b) How can constant speeds, start up and slow down for an animation sequence be modeled?
- c) For a particle moving along a curve C such that its position at time t is given by
$$x = (r \cos(t)+a, r \sin(t)+b)$$
Calculate the acceleration, the Curvature and Arc length for any time interval [a, t].

(6+6+6)