C1-R4: ADVANCED COMPUTER GRAPHICS

NOTE:

1. **Answer question 1 and any FOUR from questions 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 Rigid-Body Transformation. Also discuss the relevant matrices.

b) Give a description of Specular Reflection. Explain with the help of an example.

c) Compare and contrast between B-Spline Curve and Bezier Curve.

d) Elucidate the term “Vanishing-point” with relevant examples.

e) Clarify Kinematics & Inverse-kinematics with respect to graphics and its implications in Animations.

f) What is the CMYK colour Model? Where it is used?

g) Illustrate and explain Fractals and fractal dimensions.

(7x4)

2.

a) Explain the various types of projections using appropriate mathematical models and suitable examples.

b) What are the requirements for creation of polygon-meshes and their representations?

(12+6)

3.

a) What is the Parametric Sweeping? Give the derivation of solving any point on the surface using Bezier curve?

b) Describe briefly how an octrees can be generated for an object. What goals does Octrees implementation realize?

(12+6)

4.

a) What is the underlying concept of the Painter’s Algorithm for hidden surface removal? Identify advantages and disadvantage of the z-buffer algorithm compared to the Painter’s algorithm.

b) Answer the following:

i) Compute the size of 800 x 600 image at 240 pixels per inch.

ii) What is the resolution of 2 x 2 inch image that has 512 x 512 pixels?

iii) Calculate the height of the resized image 1024 x 768 to one that is 640 pixels wide with the same aspect ratio.

iv) Estimate the width of an image having height of 5 inches and an aspect ratio 1.5.

(12+6)

5.

a) What are the various rules of Animation? Differentiate between computer-assisted animations with computer-generated animation.

b) Describe the need for visible surface detection? Differentiate between object precision and image precision methods for detecting visible surface.

(12+6)

6.

a) Determine the equation of Bezier curve over the interval for t=0: .01: 1 and control points are at (1, 1), (2, 1), (4, 3) and (3, 1).

b) Why is homogeneous co-ordinate system required to be considered while transforming an object from one reference frame to other reference frame?

(12+6)

7.

a) The colour of an object is largely determined by its diffuse reflection coefficient. If Kd = (0.8, 0.4, 0), then what shall be the colour of the object, if the light used is blue and magenta?

b) What will be the perspective projection matrix, on the view plane z = d where the centre of projection is the origin (0, 0, 0)?

(12+6)