Q.1  
a. What are uniform periodic B-spline curves? Explain the periodic blending functions.

b. Write the openGL code for defining a two-dimensional straight line segment with coordinates (120, 20) and (30, 110).

c. Explain how a general two-dimensional fixed point scaling is carried out. Give the matrix for the operation.

d. Explain why we need line drawing algorithms to display a line on a raster monitor.

e. Explain how back faces are detected using the front-back tests.

f. What are key frame systems and how do they function? What are cels and how are they used in animation?

g. What are self-similar and self-affine fractals?  

Q.2  
a. What do you mean by the term ray-tracing? What is it used for? Briefly explain the basic ray-trace algorithm.

b. Explain in detail, how diffuse reflections are calculated.

Q.3  
a. Explain how hidden surface elimination is carried out using the scan line method.

b. Explain the Depth Buffer algorithm for Hidden Surface Elimination.

Q.4  
a. Digitize a line from (10, 12) to (20, 18) on a raster screen using Bresenham’s straight line algorithm. Show the result on a Cartesian graph.

b. Write Pseudocode for DDA algorithm. Using a suitable example, explain working of this algorithm.
Q.5  a. A mirror is placed such that it passes through (2, 0) and (0, 2). Find the reflected view of a triangle with vertices (3, 4), (5, 5) and (4, 7) in this mirror.  

b. Investigate the effect of the transformations T1 and T2 on a triangle having co-ordinates A(2,2), B(4,2) and C(4,4), where T1 denotes rotation through 90 degrees in the counter clockwise direction and T2 denotes a reflection with respect to the line $y = -x$. Do we obtain the same result when the two transformations are applied in the reverse order?  

Q.6  a. Explain the Cohen-Sutherland algorithm. This algorithm is efficient when outcode testing can be done cheaply. Explain this statement.  

b. A cubic Bezier Curve Segment is described by control points $P_0(2,2)$, $P_1(4,8)$, $P_2(8,8)$ and $P_3(9,5)$. Another curve segment is described by $Q_0(a,b)$, $Q_1(c,2)$, $Q_2(15,2)$ and $Q_3(18,2)$. Determine the value of a, b and c so that the two curve segments join smoothly.  

Q.7  a. Write a short note on the perspective projections clearly explaining vanishing points and view volumes.  

b. Explain the following terms with relevant diagram:  
(i) Orthogonal projection  
(ii) Axonomic and Isometric orthogonal projection