B4.4-R4: COMPUTER GRAPHICS AND MULTIMEDIA

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 β-spline curve.

   (b) Write the steps of a depth-buffer algorithm.

   (c) Describe refresh Cathode Ray Tube (CRT).

   (d) What are odd-even rule and nonzero winding number rule used to find interior region of the polygon ?

   (e) What are the differences between a bitmap font and a vector font ?

   (f) List and explain four factors affecting digital video.

   (g) What is the data rate for 24-bit color 640 × 480 resolution video at a frame rate of 25 frames per second ?

(7×4)

2. (a) List and explain the applications of Matrices in computer graphics.

   (b) Compare Raster Scan Display and Random Scan Display.

   (c) Clip the line AB ((5, 5), (7, 7)), PQ ((7, 9), (11, 4)) and XY ((1, 5), (4, 1)) against window (X_{min}, Y_{min}) = (4, 6) and (X_{max}, Y_{max}) = (10, 7) using cohen-sutherland algorithm.

(5+6+7)

3. (a) Explain the two-dimensional viewing-transformation pipeline. Describe window-to-viewport coordinate transformation.

   (b) Derive the Bezier curve equation from the following points P_0 (0, 0) and P_1 (7, 6), P_2 (6, 5) and P_3 (4, 0). Also, find out the mid-point of the curve.

(9+9)

4. (a) What is the transformation matrix needed to move a point +3 units in the X direction, –2 units in the Y direction, and +4 in the Z direction ? What is the transformation matrix needed to rotate an object 30 degrees about the Y-axis in a homogeneous three-dimensional Cartesian space ?

(b) How is 'diffuse' lighting different from 'ambient'lighting ? What factors determine 'diffuse'lighting ? How is 'specular' lighting different from 'diffuse'lighting ? What factors determine 'specular'lighting ?

(c) What is forward kinematics based animation ? Give a simple example. In an inverse kinematics based 3D animation system, how is the animation controlled ? In the context of animation, what is anticipation ? Give an example of anticipation.

(4+6+8)

5. (a) A typical MPEG frame sequence consists of on I-frame, three B-frames, a P-frame and three more B-frames. What overall compression ratio does this achieve ? Assume an I-frame has 15:1 compression and for P and B-frames this is 4 times and 6 times higher respectively.

(b) What are Bitmap graphics or images ?

(c) Consider the point X (3, 2) and Y (15, 5). Using Bresenham's Line Generation algorithm computer the intermediate points over the line XY.

(6+4+8)

6. (a) Consider circle center (9, 6) and radius = 5. Find the points on the circle using Breshenham's Circle generation algorithm.

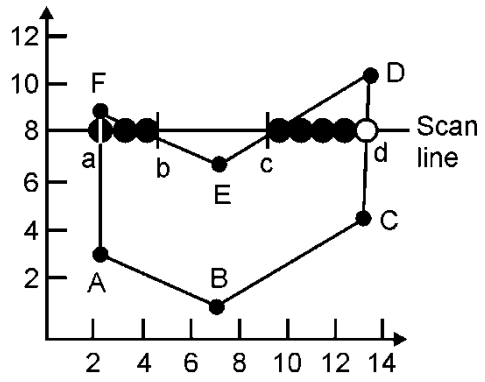
(b) Explain reflection and shearing transformation using suitable example.

(9+9)

7. (a) What is Antialiasing ? What are the ways to achieve antialiasing ?

(b) Write the steps to draw a line using DDA line generation algorithm. What are the merits of the DDA algorithm ?

(c) Create an Edge Table (ET) for following the polygon being rendered, sorted on y.



(5+5+8)