Course Code : CST 319 **CXDW/RW – 18 / 5508**

Sixth Semester B. E. (Computer Science and Engineering) Examination

COMPUTER GRAPHICS AND GUI DESIGN TECHNOLOGIES

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as indicated against them.
(2) Due credit will be given to neatness and adequate dimensions..
(3) Assume suitable data and illustrate answers with neat sketches, wherever necessary.
(4) Use Graph paper to demonstrate solution wherever necessary.

1. (a) How long would it take to load a 640 by 480 frame buffer with 12 bits per pixel, if 105 bits can be transferred per second ? How long would it take to load a 24 – bit per pixel frame buffer with a resolution of 1280 by 1024 using the same transfer rate ? 4 (CO 1)

   (b) Digitize a circle with center at $(-5, -7)$ and radius as 8. 6 (CO 2)

OR

2. (a) Explain the need of Color lookup table. Explain the organization of N bit plane gray level frame buffer with W bit wide loopup table. 4 (CO 1)

   (b) Give the significance of error term in Bresenham's line drawing algorithm. Use the same for computing the intermediate points on the dotted and dashed line drawn from $(-3, -4)$ to $(-2, 5)$. 6 (CO 2)

3. (a) Specify three OpenGL functions that deals with colors. Consider this sequence of calls :

```
glColor3f (0,1,0);
glColor3f (1,1,0);
glVertex3f (1,1,1);
glVertex3f (2,2,2);
```

   What is the color of vertex $(1, 1, 1)$ and vertex $(2, 2, 2)$? Give justification. 5 (CO 1)

OR

(b) Explain clearly what each function call does in the following main program.

```
int main(int argc, char**argv)
{
glutInit(&argc, argv) ;
glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGBA) ;
glutCreateWindow("Example") ;
glutMouseFunc(mouse) ;
glutReshapeFunc(reshape) ;
glutDisplayFunc(display) ;
init( ) ;
glutMainLoop( ) ;
glFlush( ) ;
}
```

5 (CO 1)

(c) Explain with syntax the following with respect to OPENGL :

(a) List the basic OPENGL graphics primitives.

(b) What is the command used in OPENGL to clear the screen ?

(c) What are the various OPENGL data types ?

(d) List the features of OPENGL.

(e) Write the command sequence in OPENGL to plot dots on screen. 5 (CO 1)

4. (a) Apply the following Polygon filling algorithms to fill a Polygon defined by the vertices P1 (2 , 0) , P2 (3 , 1) , P3 (5 , 1) , P4 (6 , 0) , P5 (8 , 2) , P6 (6 , 4) , P7 (4 , 2) , P8 (2 , 4) , P9 (0 , 2)
Edge Flag Algorithm
Seedfill Algorithm, where Seed Pixel as (3 , 1). 8 (CO 2)

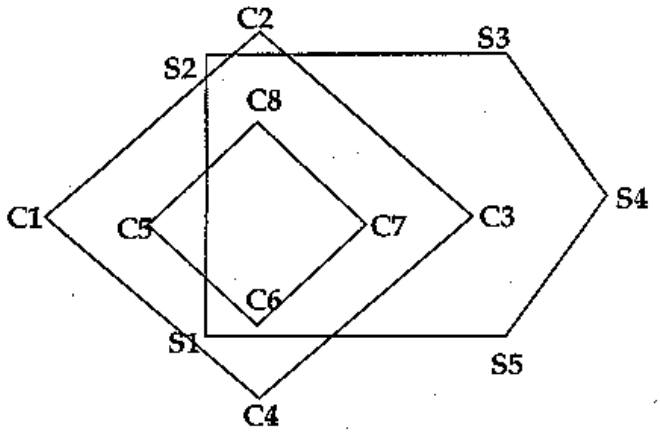
OR

(b) Scan Convert the polygon with the vertices as V1 (5 , 0) , V2 (10 , 10) , V3 (25 , 10) , V4 (30 , 0) , V5 (30 , 30) , V6 (5 , 30) , with hole H1 (10 , 15) , H2 (25 , 15) , H3 (25 , 25) , H4 (10 , 25) using Edge Flag Algorithm Seedfill Algorithm, consider Seed Pixel as (25 , 10). 8 (CO 2)

(c) Explain need of Antializing. Enlist and Explain types of Antializing. 2 (CO 4)

5. (a) Explain the example of application where the exterior clipping is useful.

Use the suitable algorithm to apply the interior as well as exterior polygon clipping in the given scenario where subject polygon is defined by vertices S1..S5 and clip polygon is defined by the vertices C1..C4 having a hole C5..C8.



5 (CO 3)

(b) Use Cyrus – Beck line clipping algorithm to clip the line P1 (– 15 , – 30) to P2 (30 , 60) against the window having diagonally opposite corners as (0 , 0) and (15 , 15). 5 (CO 3)

OR

(c) A rectangular clipping window is defined by the following window coordinates : (0 , 0) for the left, bottom corner and (5 , 4) for the right, top corner. We are also given a line segment. Line AB from A (1 , 1) to B (4 , 3) that want to clip against the window using the Cohen – Sutherland Clipping algorithm.What is the sequence of bitcodes generated by the algorithm when it is run on the line AB. Also, mention what is the final result of the clipping. 5 (CO 3)

6. Solve any **Two** :—

(a) A quad having vertices (2 , 3) , (6 , 3) , (5 , 5) , (1 , 5) is reflected about the line having equation $2y - 6x - 8 = 0$. Find the final position of the quad using 2D transformation. 5 (CO 3)

(b) Enlist and explain features of Bezier Curve.
Given Control Points (10 , 100) , (50 , 100) , (70 , 120) and (100 , 150). Calculate co – ordinates of any five points lying on the corresponding Bezier Curve. 5 (CO 3)

(c) Explain Perspective Projection. A tetrahedron is defined by the co – ordinates of its vertices as follows P1 (3 , 4 , 0) P2 (1 , 0 , 4) , P3 (2 , 0 , 5) , P4 (4 , 0 , 3), Find the Perspective projection onto the plane y = 4. The center of the projection is located at (3 , 0 , 0). 5 (CO 3)

7. (a) Explain Quadtree Structure used in Area Subdivision algorithm by considering the suitable resolution of the display window upto 3 levels.
Apply the Intersection Test to check the above polygon is intersecting or surrounding.
Window having diagonal co – ordinates as (10 , 10) and (50 , 50)
Polygon : P1 (30 , 55) , P2 (60 , 70) , P3 (70 , 10) , P4 (10 , – 20) , P5 (0 , 30) , P6 (0 , 70) 6 (CO 4)

(b) Explain Z – buffer algorithm with example. Explain the syntax of the functions used to implement Z – buffer algorithm in OpenGL function. 4 (CO 4)

OR

(c) What is mean by Mach – band effect ? Explain Shading model which has Mach – band effect. 4 (CO 4)