NITTE EDUCATION TRUST | N.M.A.M. INSTITUTE OF TECHNOLOGY
(An Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi)
Nitte – 574 110, Karnataka, India
(ISO 9001:2015 Certified)
Accredited with 'A' Grade by NAAC
Department of Computer Science & Engineering

COMPUTER GRAPHICS LAB MANUAL

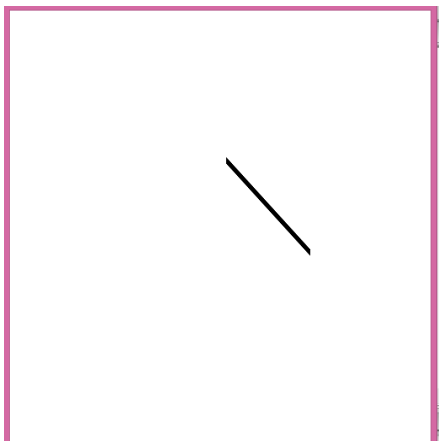
Department of computer science and engineering
Year 2025 2026

1. Program to implement Mid Point Line Algorithm. The line coordinates should be specified by the user.

```
#include <GL/glut.h>
#include <stdio.h>

int x00,y00,x01,y01;


void init()
{
  glClearColor(1,1,1,1);
  glClear(GL_COLOR_BUFFER_BIT);
  glMatrixMode(GL_PROJECTION);
  gluOrtho2D(-500,500,-500,500);
}

void writepixel(int x,int y)
{
   glPointSize(5);
  glBegin(GL_POINTS);       //WRITE PIXEL
  glColor3f(0,0,0);
  glVertex2f(x,y);
  glEnd();
  glFlush();
}
void display()
{

  int i,j;

  float dx=x01-x00 , dy = y01-y00;
  float d = 2*dy-dx;

  float incrE = dy;
  float incrNE = dy - dx;

  int x=x00,y=y00;

  writepixel(x,y);

    while(x<x01)
   {
```

```
  if(d<=0)
    {
                d=d+2*incrE;
      x=x+1;
    }
        else
         {
                d=d+2*incrNE;
      x=x+1;
      y=y+1;
         }
 writepixel(x,y);
 }
}

int main(int argc,char *argv[])
{

 printf("Enter the values \n");
 printf("x0="); scanf("%d",&x00);
 printf("y0="); scanf("%d",&y00);
 printf("x1="); scanf("%d",&x01);
 printf("y1="); scanf("%d",&y01);

 glutInit(&argc,argv);
 glutInitWindowSize(500,500);
 glutCreateWindow("MIDPOINT LINE ALGORITHM");
 init();
 glutDisplayFunc(display);
 glutMainLoop();
 return 0;
}
```

OUT PUT:

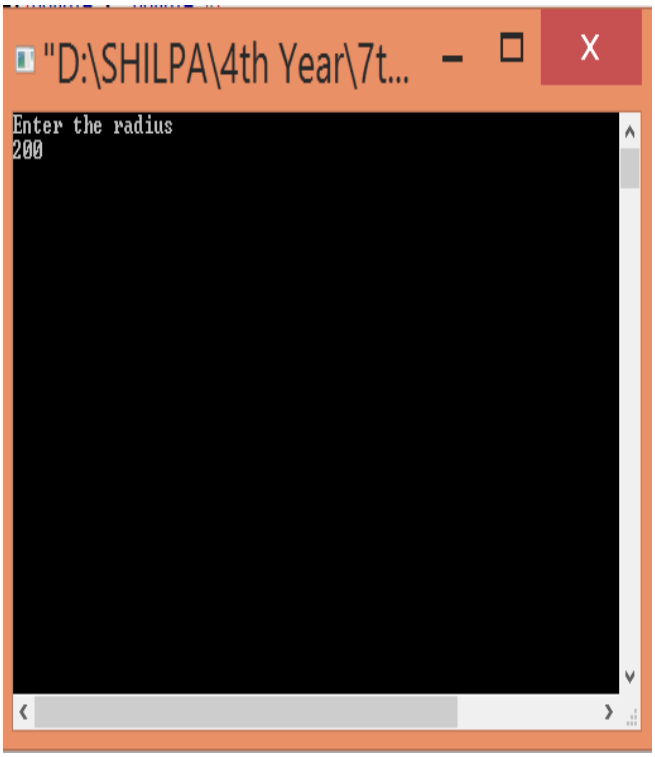


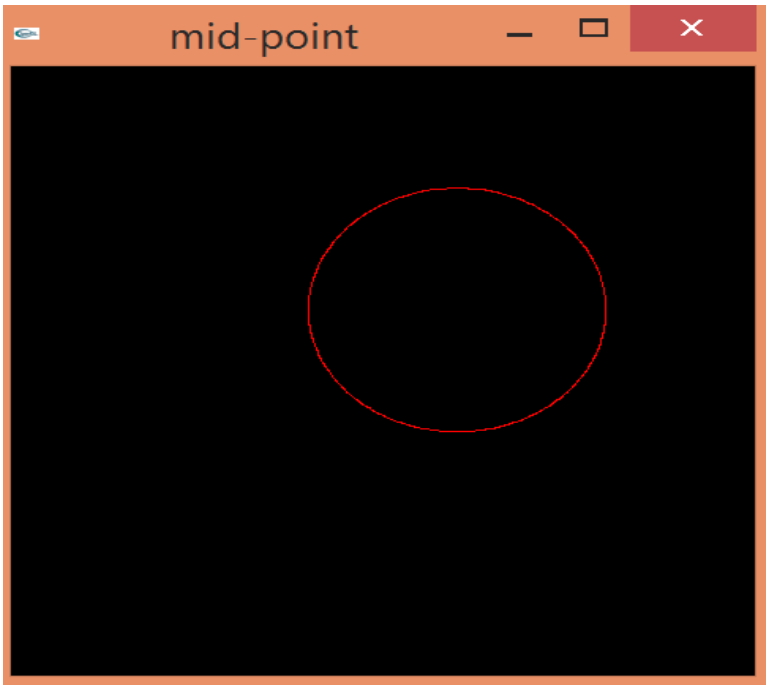
2. Program to implement Mid Point Circle Algorithm. The radius should be specified by the user.

```
#include <GL/glut.h>
#include <stdio.h>
float x ;
float y ;
float r;
void init()
{
  glClearColor(0.0,0.0,0.0,0.0);
  glClear(GL_COLOR_BUFFER_BIT);
  glMatrixMode(GL_PROJECTION);
  gluOrtho2D(-900,900,-900,900);
}

void writepixel(float x,float y)
{
glPointSize(5);
glBegin(GL_POINTS);
glColor3f(1.0,0.0,0.0);
glVertex2f(x,y);
glEnd();
glFlush();
}
void midpointcircle( )
{
x=0;
y=r;
double d=5.0/4.0-r;
writepixel(x,y);
while(y>x)
{
   if(d<0)
```

```
    d=d+2.0*x+3.0;
  else
   {
    d=d+2.0*(x-y)+5.0;
    y--;
   }
  x++;
  writepixel(x,y);
  writepixel(y,x);
  writepixel(y,-x);
  writepixel(x,-y);
  writepixel(-x,-y);
  writepixel(-y,-x);
  writepixel(-y,x);
  writepixel(-x,y);
  glFlush();
 }
}

int main(int argc,char *argv[])
{
  printf("Enter the radius of the circle\n");
  scanf("%f",&r);

  glutInit(&argc,argv);
  glutInitWindowSize(500,500);
  glutCreateWindow("Midpoint Circle Algorithm");
  init();
  glutDisplayFunc(midpointcircle);
  glutMainLoop();
  return 0;
}
```

OUT PUT





3. Program to implement Liang-Barsky line clipping algorithm. Make provision to specify the input line, window for clipping and viewport for displaying the clipped image.

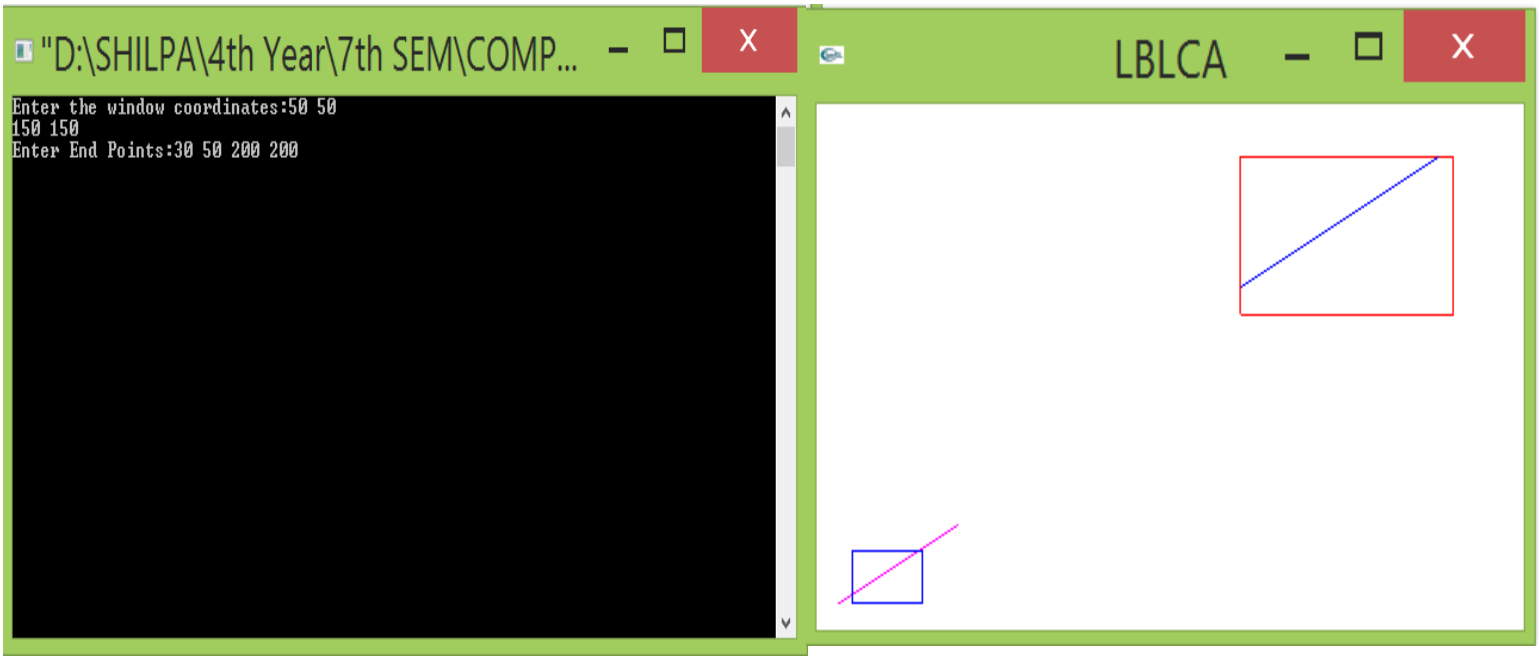
```
#include<windows.h>
#include<stdio.h>
#include<GL/glut.h>
float xmin,ymin,xmax,ymax;
double xvmin=600,yvmin=600,xvmax=900,yvmax=900;
int  x0,x1,y1,y0;

int cliptest(double p,double q,double *t1,double *t2)
{
        double t=q/p;
        if(p<0.0)
        {
                if(t>*t1) *t1=t;
                if(t>*t2) return(false);
        }
        else
                if(p>0.0)
                {
                        if(t<*t2) *t2=t;
                        if(t<*t1) return(false);
```

```
		}
		else
			if(p==0.0)
			{
				if(q<0.0) return(false);
			}
			return(true);
}

void LiangBarskyLineClipAndDraw(double x0,double y0,double x1,double y1)
{
	double dx=x1-x0,dy=y1-y0,te=0.0,t1=1.0;
	if(cliptest(-dx,x0-xmin,&te,&t1))
		if(cliptest(dx,xmax-x0,&te,&t1))
			if(cliptest(-dy,y0-ymin,&te,&t1))
				if(cliptest(dy,ymax-y0,&te,&t1))
				{
					if(t1<1.0)
					{
						x1=x0+t1*dx;
						y1=y0+t1*dy;
					}
					if(te>0.0)
					{
						x0=x0+te*dx;
						y0=y0+te*dy;
					}
					double sx=(xvmax-xvmin)/(xmax-xmin);
					double sy=(yvmax-yvmin)/(ymax-ymin);
					double vx0=xvmin+(x0-xmin)*sx;
					double vy0=yvmin+(y0-ymin)*sy;
					double vx1=xvmin+(x1-xmin)*sx;
					double vy1=yvmin+(y1-ymin)*sy;
					glColor3f(1.0,0.0,0.0);
					glBegin(GL_LINE_LOOP);
					glVertex2f(xvmin,yvmin);
					glVertex2f(xvmax,yvmin);
					glVertex2f(xvmax,yvmax);
					glVertex2f(xvmin,yvmax);
					glEnd();
					glColor3f(0.0,0.0,1.0);
					glBegin(GL_LINES);
					glVertex2d(vx0,vy0);
					glVertex2d(vx1,vy1);
					glEnd();
```

```
                        }
}
void drawrect()
{
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
        glVertex2f(xmin,ymin);
        glVertex2f(xmax,ymin);
        glVertex2f(xmax,ymax);
        glVertex2f(xmin,ymax);
        glEnd();
}
void drawline()
{
        glColor3f(1.0,0.0,1.0);
        glBegin(GL_LINES);
        glVertex2d(x0,y0);
        glVertex2d(x1,y1);
        glEnd();
}
void display()
{
        glClear(GL_COLOR_BUFFER_BIT);
        drawline();
        drawrect();
        LiangBarskyLineClipAndDraw(x0,y0,x1,y1);
        glFlush();
}
void myinit()
{
        glClearColor(1.0,1.0,1.0,1.0);
        glColor3f(1.0,0.0,0.0);
        glPointSize(1.0);
        glMatrixMode(GL_PROJECTION);
        glLoadIdentity();
        gluOrtho2D(0.0,1000.0,0.0,1000.0);
}
int main(int argc,char** argv)
{
        printf("Enter the window coordinates:");
        scanf("%f%f%f%f",&xmin,&ymin,&xmax,&ymax);
        printf("Enter End Points:");
        scanf("%d%d%d%d",&x0,&y0,&x1,&y1);
        glutInit(&argc,argv);
        glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
```

```
        glutInitWindowSize(500,500);
        glutInitWindowPosition(0,0);
        glutCreateWindow("LBLCA");
        glutDisplayFunc(display);
        myinit();
        glutMainLoop();
        return 0;
}// Try for input values 100,100,500,500;
```

OUT PUT:



4. Program to implement the Cohen-Sutherland line-clipping algorithm. Make provision to specify the input line, window for clipping and viewport for displaying the clipped image.

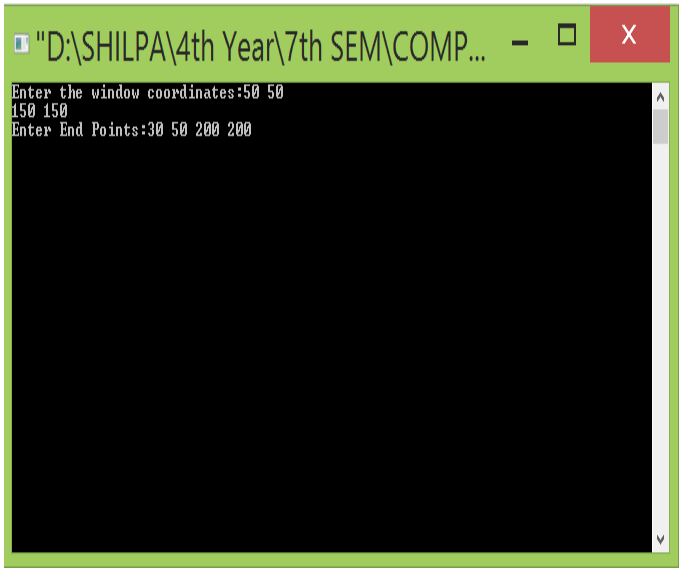
```
#include<GL/glut.h>
#include <stdio.h>
#include <stdbool.h>

typedef int Outcode;

const int INSIDE=0;
const int LEFT=1;
const int RIGHT=2;
const int BOTTOM=4;
```

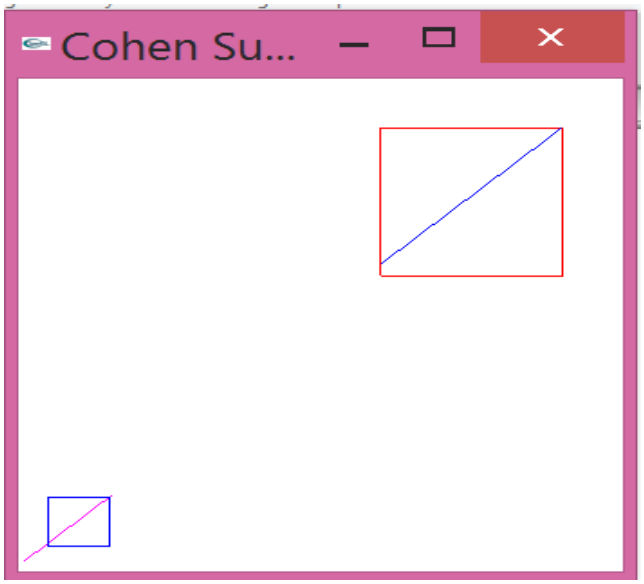
```
const int TOP=8;
double  xmin=50,ymin=50,xmax=100,ymax=100;

void init()
{
glClearColor(1,2,3,1);
glClear(GL_COLOR_BUFFER_BIT);
glMatrixMode(GL_PROJECTION);
gluOrtho2D(0,500,0,500);
}


Outcode Computecode( double x, double y)
{
Outcode code=INSIDE;

if(x<xmin)
code|=LEFT;
else if(x>xmax)
code|=RIGHT;
else if(y<ymin)
code|=BOTTOM;
else if(y>ymax)
code|=TOP;

return code;
}

void CohenSutherlandline(double x0,double a,double x1,double b)
{

bool accept =false;
Outcode outcode0=Computecode(x0,a);
Outcode outcode1=Computecode(x1,b);
double x,y;

while(true)
{
if(!(outcode0|outcode1)){
accept =true;
break;
}
else if(outcode0 & outcode1)
{
 break;
```

```
}
else
{

Outcode outcodeout =outcode0?outcode0:outcode1;
if(outcodeout & TOP)
{
x=x0 +(x1-x0)*(ymax-a)/(b-a);
y=ymax;
}
else if(outcodeout & BOTTOM)
{
x=x0+(x1-x0)*(ymin-a)/(b-a);
y=ymin;
}
else if(outcodeout & RIGHT)
{
y=a +(b-a)*(xmax-x0)/(x1-x0);
x=xmax;
}
else if(outcodeout & LEFT)
{
y=a +(b-a)*(xmin-x0)/(x1-x0);
x=xmin;
}
if(outcodeout == outcode0)
{
x0=x;
a=y;
outcode0=Computecode(x0,a);
}
else
{
x1=x;
b=y;
outcode1=Computecode(x1,b);
}
}
}
if(accept)
{
glColor3f(1.0,0.0,0.0);
glBegin(GL_LINE_LOOP);
glVertex2f(4*xmin,4*ymin);
glVertex2f(4*xmax,4*ymin);
```

```
glVertex2f(4*xmax,4*ymax);
glVertex2f(4*xmin,4*ymax);
glEnd();
glBegin(GL_LINES);
glVertex2f(4*x0,4*a);
glVertex2f(4*x1,4*b);
glEnd();
}
}

void display()
{
double x0=60,a=20,x1=80,b=120;
glBegin(GL_LINE_LOOP);
glColor3f(1.0,0.0,0.0);
glVertex2f(xmin,ymin);
glVertex2f(xmax,ymin);
glVertex2f(xmax,ymax);
glVertex2f(xmin,ymax);
glEnd();

glBegin(GL_LINES);
glVertex2f(x0,a);
glVertex2f(x1,b);
glEnd();

CohenSutherlandline(x0,a,x1,b);
glFlush();
}

int main(int argc, char **argv)
{
glutInit(&argc,argv);
glutInitWindowSize(800,800);
glutCreateWindow("Cohen Sutherland line clipping window");
init();
glutDisplayFunc(display);
glutMainLoop();
return 0;
}
```

OUT P





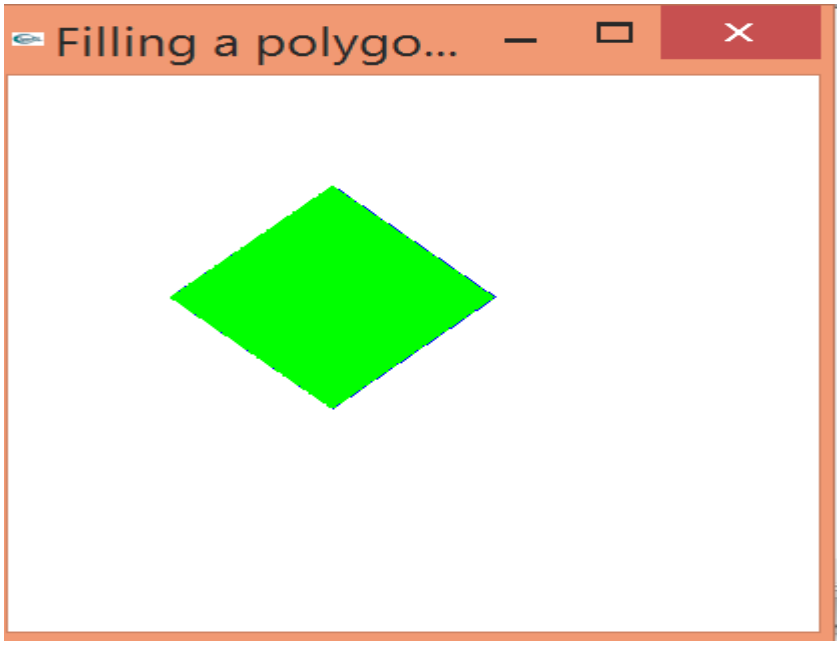
5. Program to fill any given polygon using scan-line area filling algorithm. vertices for the polygon should be specified by the user.

```
#include<windows.h>
#define BLACK 0
#include<stdlib.h>
#include<stdio.h>
#include<GL/glut.h>
float x1,x2,x3,x4,y1,y2,y3,y4;
void edgedetect(float x1,float y1,float x2,float y2,int *le,int *re)
{
        float mx,x,temp;
        int i;
        if((y2-y1)<0)
        {
                temp=y1;
                y1=y2;
                y2=temp;
                temp=x1;
                x1=x2;
                x2=temp;
        }
        if((y2-y1)!=0)
                mx=(x2-x1)/(y2-y1);
        else
                mx=x2-x1;
        x=x1;
        for(i=y1;i<=y2;i++)
```

```
        {
                if(x<(float)le[i])
                        le[i]=(int)x;
                if(x>(float)re[i])
                        re[i]=(int)x;
                x+=mx;
        }
}

void draw_pixel(int x,int y)
{
        glColor3f(0.0,1.0,0.0);
        glPointSize(3.0);
        glBegin(GL_POINTS);
        glVertex2i(x,y);
        glEnd();
}

void scanfill(float x1,float y1,float x2,float y2,float x3,float y3,float x4,float y4)
{
        int le[500],re[500];
        int i,y;
        for(i=0;i<500;i++)
        {
                le[i]=500;re[i]=0;
        }
        edgedetect(x1,y1,x2,y2,le,re);
        edgedetect(x2,y2,x3,y3,le,re);
        edgedetect(x3,y3,x4,y4,le,re);
        edgedetect(x4,y4,x1,y1,le,re);
        for(y=0;y<500;y++)
        {
                if(le[y]<=re[y])
                        for(i=(int)le[y];i<(int)re[y];i++)
        {


                                draw_pixel(i,y);
                                Sleep(1);
                                glFlush();
        }
        }
}

void display()
```

```
{
        x1=20.0;y1=20.0;x2=10.0;y2=30.0;x3=20.0;y3=40.0;x4=30.0;y4=30.0;
        glClear(GL_COLOR_BUFFER_BIT);
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
        glVertex2f(x1,y1);
        glVertex2f(x2,y2);
        glVertex2f(x3,y3);
        glVertex2f(x4,y4);
        glEnd();
        scanfill(x1,y1,x2,y2,x3,y3,x4,y4);
        glFlush();
}

void myinit()
{
        glClearColor(1.0,1.0,1.0,1.0);
        glColor3f(1.0,0.0,0.0);
        glPointSize(1.0);
        glMatrixMode(GL_PROJECTION);
        glLoadIdentity();
        gluOrtho2D(0.0,50.0,0.0,50.0);

}

int main(int argc,char **argv)
{
        glutInit(&argc,argv);
        glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
        glutInitWindowSize(500,500);
        glutInitWindowPosition(0,0);
        glutCreateWindow("Filling a polygon using Scan-Line Algorithm");
        glutDisplayFunc(display);
        myinit();
        glutMainLoop();
}
```

OUT PUT



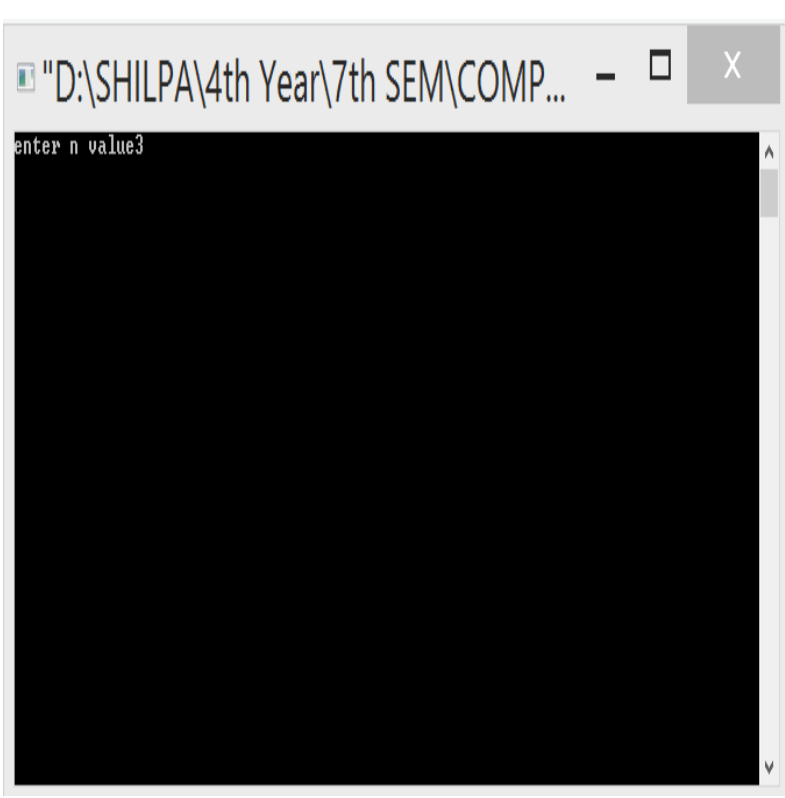
6. Program to recursively subdivide a triangle to form 2D Sierpinski gasket. The number of recursive steps is to be specified by the user

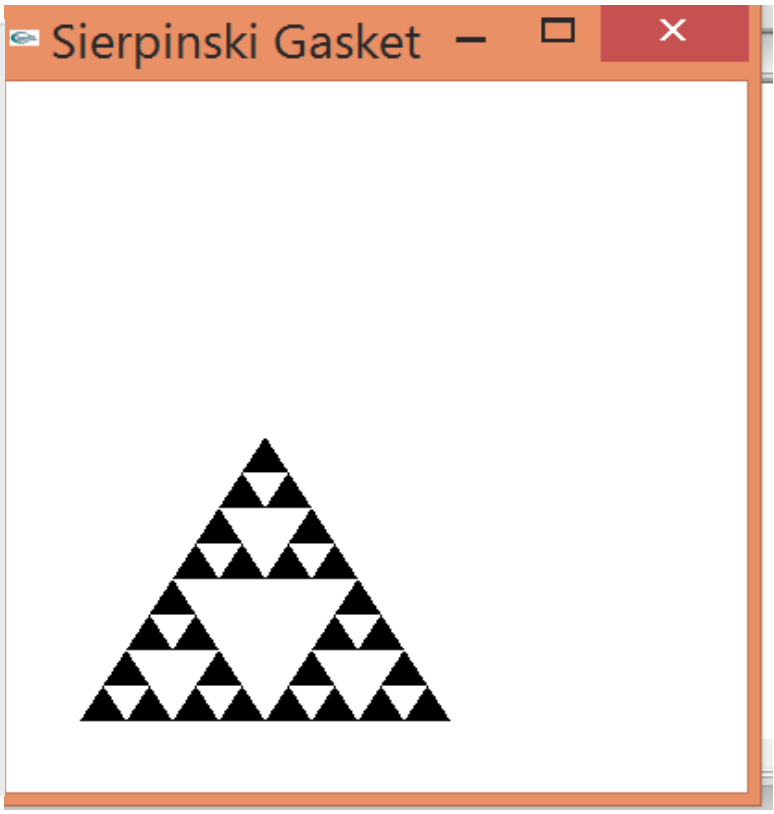
```
#include <windows.h>
#include <GL/glut.h>
#include <stdio.h>
int n;

void init()
{
    glClearColor(1.0, 1.0, 1.0, 1.0);
    glClear(GL_COLOR_BUFFER_BIT);
    glMatrixMode(GL_PROJECTION);
    gluOrtho2D(0, 10, 0, 10);
}

void triangle(float *a,float *b, float *c)
{
   glVertex2f(a[0],a[1]);
   glVertex2f(b[0],b[1]);
   glVertex2f(c[0],c[1]);
}

void draw_triangle(float *a,float *b,float *c , int k)
```

```
{
        float ab[2],ac[2],bc[2];
        int i;
        if(k>0)
        {
         for(i=0;i<2;i++)
                ab[i]=(a[i]+b[i])/2;
         for(i=0;i<2;i++)
                bc[i]=(b[i]+c[i])/2;
         for(i=0;i<2;i++)
                ac[i]=(a[i]+c[i])/2;

         draw_triangle(a,ab,ac,k-1);
         draw_triangle(b,bc,ab,k-1);
         draw_triangle(c,ac,bc,k-1);
        }
        else
        {
       triangle(a,b,c);
        }
}

void display()
{
   float a[2]={1,1};
   float b[2]={6,1};
   float c[2]={3.5,5};

   glBegin(GL_TRIANGLES);
   glColor3f(0,0,0);
   draw_triangle(a,b,c,n);
   glEnd();
   glFlush();
}
int main(int argc, char** argv)

{
   printf("enter n value");
   scanf("%d",&n);
   glutInit(&argc,argv);
   glutInitWindowSize(500,500);
   glutCreateWindow("Sierpinski Gasket");
   init();
   glutDisplayFunc(display);
   glutMainLoop();
```

```
    return 0;
}
```

OUT PUT

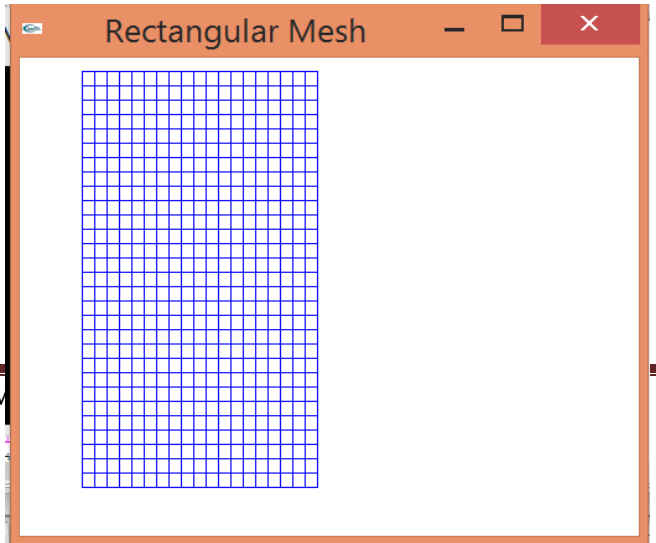




7. Program to display a set of values {f(i, j)} as a rectangular mesh. Number of rows and columns for the mesh generation must be taken from the user.

```
#include<windows.h>
#include<stdlib.h>
#include<GL/glut.h>
#define maxx 20
#define maxy 30
#define dx 10
#define dy 15
GLfloat x[maxx]={0.0},y[maxy]={0.0};
GLfloat x0=50,y0=50;
GLint i,j;
void init()
{
        glClearColor(1.0,1.0,1.0,1.0);
        glColor3f(1.0,0.0,0.0);
        glPointSize(5.0);
```

```
        glMatrixMode(GL_PROJECTION);
        glLoadIdentity();
        gluOrtho2D(0.0,499.0,0.0,499.0);
        glutPostRedisplay();
}
void display(void)
{
        glClear(GL_COLOR_BUFFER_BIT);
        glColor3f(0.0,0.0,1.0);
        for(i=0;i<maxx;i++)
                x[i]=x0+i*dx;
        for(j=0;j<maxy;j++)
                y[j]=y0+j*dy;
        glColor3f(0.0,0.0,1.0);
        for(i=0;i<maxx-1;i++)  // Filling mesh from bottom to top and left to right
                for(j=0;j<maxy-1;j++)
                {
                        glColor3f(0.0,0.0,1.0);
                        glBegin(GL_LINE_LOOP);
                        glVertex2f(x[i],y[j]);
                        glVertex2f(x[i],y[j+1]);
                        glVertex2f(x[i+1],y[j+1]);
                        glVertex2f(x[i+1],y[j]);
                        glEnd();
                        glFlush();
                }
                glFlush();

}
int main(int argc,char **argv)
{
        glutInit(&argc,argv);
        glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
        glutInitWindowSize(500,400);
        glutInitWindowPosition(0,0);
        glutCreateWindow("Rectangular Mesh");
                                                glutDisplayFunc(display);
                                                init();
                                                glutMainLoop();
}
```



OUT PUT

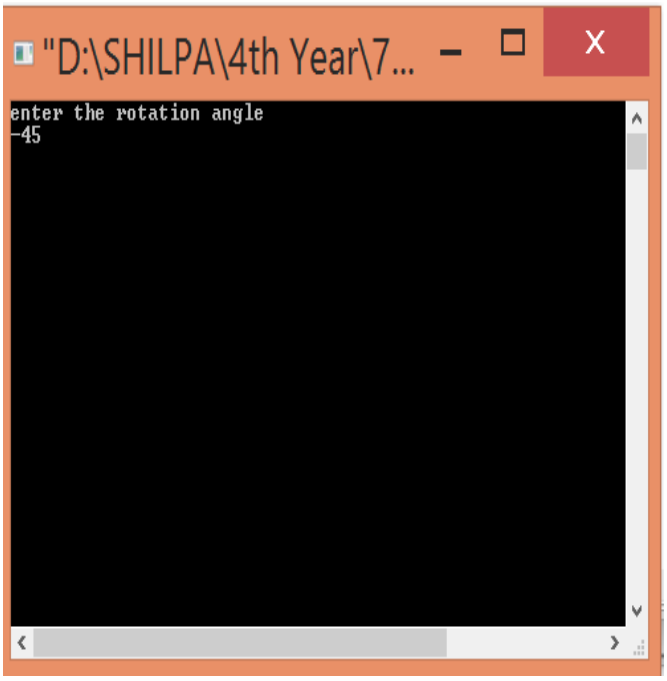
8. Program to create a random figure and rotate it about a given fixed point using transformation matrices. Make provision for the user to enter pivot point for the rotation.

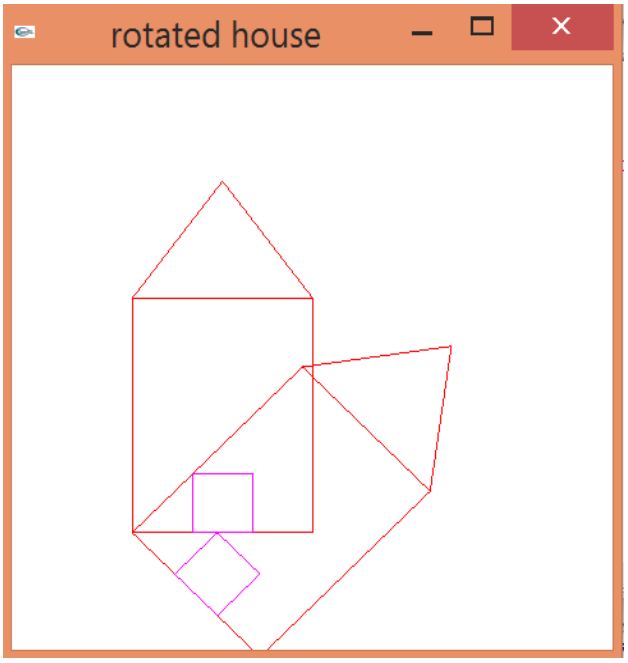
```
#include<windows.h>
#include<stdio.h>
#include<math.h>
#include<GL/glut.h>
GLfloat house[2][9]={{100.0,100.0,175.0,250.0,250.0,150.0,150.0,200.0,200.0},
{100.0,300.0,400.0,300.0,100.0,100.0,150.0,150.0,100.0}};
GLfloat theta;
GLfloat h=100.0;
GLfloat k=100.0;
void drawhouse()
{
   glColor3f(1.0,0.0,0.0);
   glBegin(GL_LINE_LOOP);
   glVertex2f(house[0][0],house[1][0]);
   glVertex2f(house[0][1],house[1][1]);
   glVertex2f(house[0][3],house[1][3]);
   glVertex2f(house[0][4],house[1][4]);
   glEnd();
   glColor3f(1.0,0.0,1.0);
   glBegin(GL_LINE_LOOP);
   glVertex2f(house[0][5],house[1][5]);
   glVertex2f(house[0][6],house[1][6]);
   glVertex2f(house[0][7],house[1][7]);
   glVertex2f(house[0][8],house[1][8]);
   glEnd();
   glColor3f(1.0,0.0,0.0);
   glBegin(GL_LINE_LOOP);
   glVertex2f(house[0][1],house[1][1]);
   glVertex2f(house[0][2],house[1][2]);
   glVertex2f(house[0][3],house[1][3]);
```

```
    glEnd();
}
void display()
{
    int i;
    GLfloat m[16],p,q;


    p=-h*(cos(theta)-1)+k*(sin(theta));
    q=-k*(cos(theta)-1)-h*(sin(theta));
    for(i=0;i<15;i++)
        m[i]=0.0;
    m[0]=cos(theta);
    m[1]=sin(theta);
    m[4]=-sin(theta);
    m[5]=cos(theta);
    m[12]=p;
    m[13]=q;
    m[10]=1;
    m[15]=1;
    glMatrixMode(GL_MODELVIEW);
    glClear(GL_COLOR_BUFFER_BIT);
    drawhouse();
    glPushMatrix();
    glMultMatrixf(m);
    drawhouse();
    glPopMatrix();
    glFlush();
}
void myinit()
{
    glClearColor(1.0,1.0,1.0,1.0);
    glColor3f(1.0,1.0,0.0);
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
    gluOrtho2D(0.0,499.0,0.0,499.0);
    glMatrixMode(GL_MODELVIEW);
}
int main(int argc,char **argv)
{
    printf("enter the rotation angle\n");
    scanf("%f",&theta);
    theta=theta*3.141/180;
    glutInit(&argc,argv);
    glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
```

```
    glutInitWindowSize(500,500);
    glutInitWindowPosition(0,0);
    glutCreateWindow("rotated house");
    glutDisplayFunc(display);
    myinit();
    glutMainLoop();
    return 0;
}
```

OUT PUT





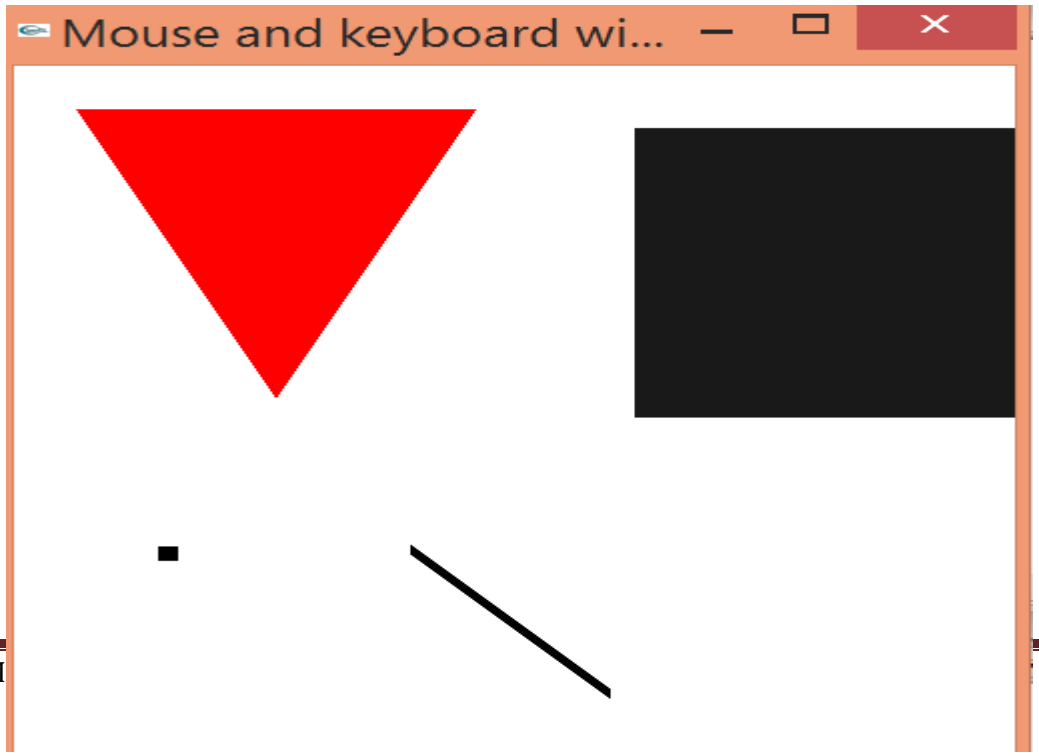
9.Program to create a random object and to implement the suggested mouse and keyboard interactions through OpenGL function.

```
#include<windows.h>
#include<GL/glut.h>
#include<stdio.h>
#include<math.h>
GLfloat wh=500, ww=500;
GLfloat size=10.0;

void init()
{

    glClearColor(1,1,1,1);
    glClear(GL_COLOR_BUFFER_BIT);
    glColor3f(0,1,0);
```

```
   glMatrixMode(GL_PROJECTION);
   glLoadIdentity();
   gluOrtho2D(0,ww,0,wh);

}

void myReshape(GLint w, GLint h)
{

   glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
   gluOrtho2D(0,double(w),0,double(h));

glMatrixMode(GL_MODELVIEW);
   glLoadIdentity();
   glViewport(0,0,w,h);
   ww=w;
   wh=h;

}
void draw(int x, int y)
{

   glClearColor(1,1,1,1);
   glClear(GL_COLOR_BUFFER_BIT);
   y=wh-y;
   glBegin(GL_POLYGON);
   glVertex2f(x+size, y+size);
   glVertex2f(x-size, y+size);
   glVertex2f(x-size, y-size);
   glVertex2f(x+size, y-size);
   glEnd();
   glFlush();
}

void mymouse(int btn, int state, int x, int y)
{

   if(btn==GLUT_RIGHT_BUTTON && state== GLUT_DOWN)
      draw(x,y);


}

void display()
```

```
{

   glClearColor(1,0,0,0);
   glClear(GL_COLOR_BUFFER_BIT);

   glFlush();

}



int main(int argc, char ** argv)
{

   glutInit(&argc, argv);
   glutInitDisplayMode(GLUT_SINGLE |GLUT_RGB);
   glutInitWindowSize(wh,ww);
   glutInitWindowPosition(0,0);
   glutCreateWindow("NITTE");
   init();
   glutDisplayFunc(display);

   glutMouseFunc(mymouse);
   glutReshapeFunc(myReshape);
   glutMainLoop();

}
```

OUT PUT



10. Program to draw a color cube and spin it using OpenGL transformation matrices along x, y and z axes.

```
#include<windows.h>
#include<stdlib.h>
#include<GL/glut.h>
#include<stdio.h>
GLfloat vertices[][3]={{-1.0,-1.0,-1.0},{1.0,-1.0,-1.0},{1.0,1.0,-1.0},
        {-1.0,1.0,-1.0},{-1.0,-1.0,1.0},{1.0,-1.0,1.0},{1.0,1.0,1.0},{-1.0,1.0,1.0}};
GLfloat normals[][3]={{-1.0,-1.0,-1.0},{1.0,-1.0,1.0},{1.0,1.0,-1.0},
      {-1.0,1.0,-1.0},{-1.0,-1.0,1.0},{1.0,-1.0,1.0},{1.0,1.0,1.0},{-1.0,1.0,1.0}};
GLfloat colors[][3]={{0.0,0.0,0.0},{1.0,0.0,0.0},{1.0,1.0,0.0},{0.0,1.0,0.0},
                    {0.0,0.0,1.0},{1.0,0.0,1.0},{1.0,1.0,1.0},{0.0,1.0,1.0}};

void polygon(int a,int b,int c,int d)
{
        glBegin(GL_POLYGON);
        glColor3fv(colors[a]);
glNormal3fv(normals[a]);
        glVertex3fv(vertices[a]);
        glColor3fv(colors[b]);
        glNormal3fv(normals[b]);
        glVertex3fv(vertices[b]);
        glColor3fv(colors[c]);
        glNormal3fv(normals[c]);
        glVertex3fv(vertices[c]);
        glColor3fv(colors[d]);
        glNormal3fv(normals[d]);
        glVertex3fv(vertices[d]);
        glEnd();
}
void colorcube(void)
{
        polygon(0,3,2,1);
        polygon(2,3,7,6);
        polygon(0,4,7,3);
        polygon(1,2,7,6);
        polygon(4,5,6,7);
        polygon(0,1,5,4);
}
```

```
static GLfloat theta[]={0.0,0.0,0.0};
static GLint axis=2;
void display(void)
{
	glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT);
	glLoadIdentity();
	glRotatef(theta[0],1.0,0.0,0.0);
	glRotatef(theta[1],0.0,1.0,0.0);
	glRotatef(theta[2],0.0,0.0,1.0);
	colorcube();
	glFlush();
	glutSwapBuffers();
}
void spinCube()
{
	theta[axis]+=1.0;
	if(theta[axis]>360.0) theta[axis]-=360.0;
	glutPostRedisplay();
}
void mouse(int btn,int state,int x,int y)
{
	if(btn==GLUT_LEFT_BUTTON&&state==GLUT_DOWN)axis=0;
	if(btn==GLUT_MIDDLE_BUTTON&&state==GLUT_DOWN)axis=1;
	if(btn==GLUT_RIGHT_BUTTON&&state==GLUT_DOWN)axis=2;
}
void myReshape(int w,int h)
{
	glViewport(0,0,w,h);
	glMatrixMode(GL_PROJECTION);
	glLoadIdentity();
	if(w<=h)
		glOrtho(-2.0,2.0,-2.0*(GLfloat)h/(GLfloat)w,2.0*(GLfloat)h/(GLfloat)w,-
10.0,10.0);
	else
		glOrtho(-2.0*(GLfloat)w/(GLfloat)h,2.0*(GLfloat)w/(GLfloat)h,-2.0,2.0,-
10.0,10.0);
	glMatrixMode(GL_MODELVIEW);

}
int main(int argc,char **argv)
{
	glutInit(&argc,argv);
	glutInitDisplayMode(GLUT_DOUBLE|GLUT_RGB|GLUT_DEPTH);
	glutInitWindowSize(500,500);
	glutCreateWindow("Rotating a color cube");
```

```
    glutReshapeFunc(myReshape);
    glutDisplayFunc(display);
    glutIdleFunc(spinCube);
    glutMouseFunc(mouse);
    glEnable(GL_DEPTH_TEST);
    glutMainLoop();
}
```

OUT PUT