Practical No:7

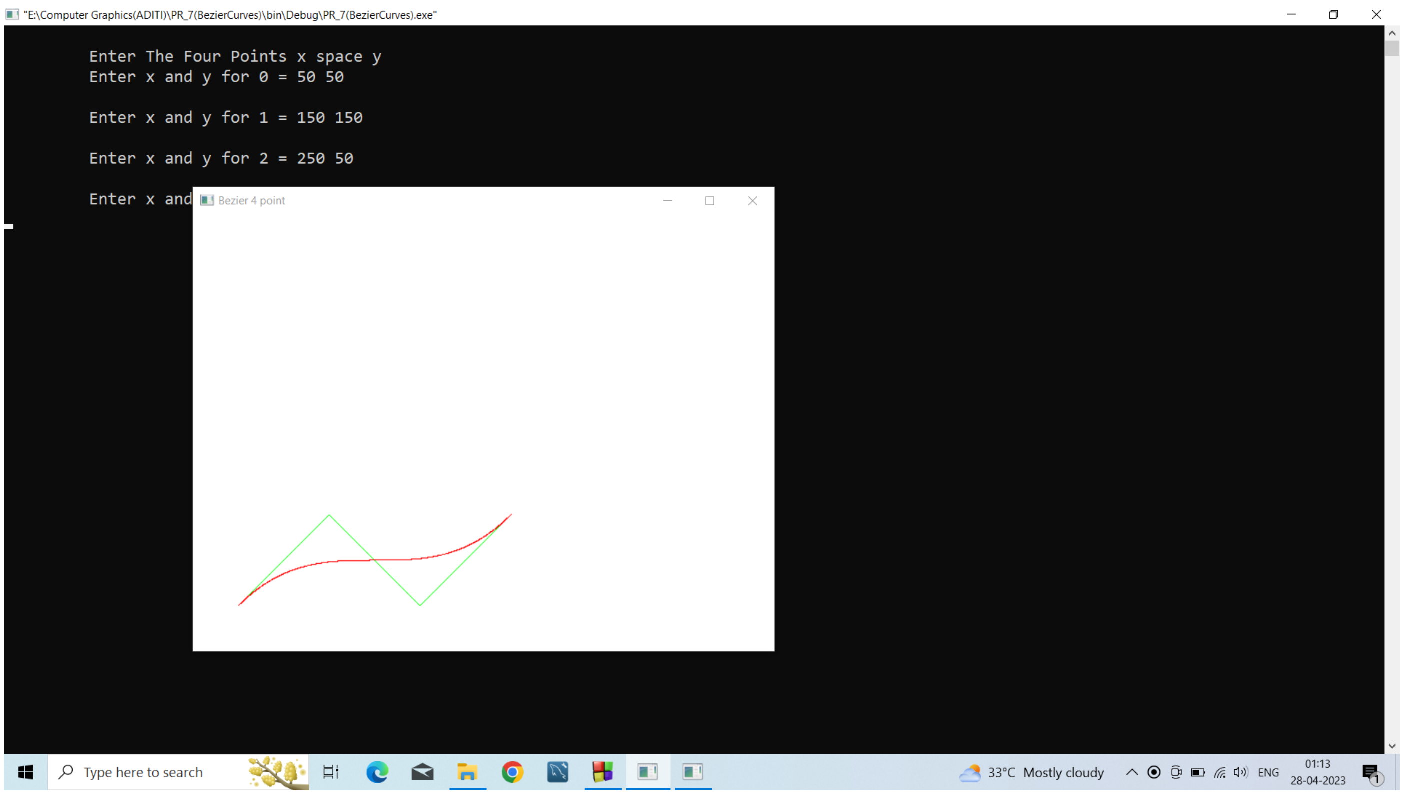
1) **Generate fractal patterns using i) Bezier ii) Koch Curve.**

Code: i) Bezier Curve

```
#include <iostream>
#include <math.h>
#include <time.h>
#include <GL/glut.h>
using namespace std;
int x[4],y[4];
void init()
{
   glClearColor(1.0,1.0,1.0,0.0);
   glMatrixMode(GL_PROJECTION);
   gluOrtho2D(0,640,0,480);
   glClear(GL_COLOR_BUFFER_BIT);
}
void putpixel(double xt,double yt )
{
   glColor3f(1,0,0);
   glBegin(GL_POINTS);
         glVertex2d(xt,yt);
      glEnd();
      glFlush();
}
void Algorithm()
{
   glColor3f(0,1,0);
   glBegin(GL_LINES);
      glVertex2i(x[0],y[0]);
      glVertex2i(x[1],y[1]);
      glVertex2i(x[1],y[1]);
```

```
        glVertex2i(x[2],y[2]);
        glVertex2i(x[2],y[2]);
        glVertex2i(x[3],y[3]);
    glEnd();
    glFlush();
    double t;
    for (t = 0.0; t < 1.0; t += 0.0005)
    {
        double xt = pow(1-t, 3) * x[0] + 3 * t * pow(1-t, 2) * x[1] + 3 * pow(t, 2)
* (1-t) * x[2] + pow(t, 3) * x[3];
        double yt = pow(1-t, 3) * y[0] + 3 * t * pow(1-t, 2) * y[1] + 3 * pow(t, 2)
* (1-t) * y[2] + pow(t, 3) * y[3];
        putpixel(xt, yt);
    }
}
int main(int argc, char** argv)
  {
    cout<<"\n \t Enter The Four Points x space y ";
    for(int i=0;i<4;i++)
   {
        cout<<"\n \t Enter x and y for "<<i<<" = ";
        cin>>x[i]>>y[i];
    }
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
    glutInitWindowSize(640,480);
    glutInitWindowPosition(200,200);
    glutCreateWindow("Bezier 4 point");
    init();
    glutDisplayFunc(Algorithm);
    glutMainLoop();
    return 0;
}
```

Output:



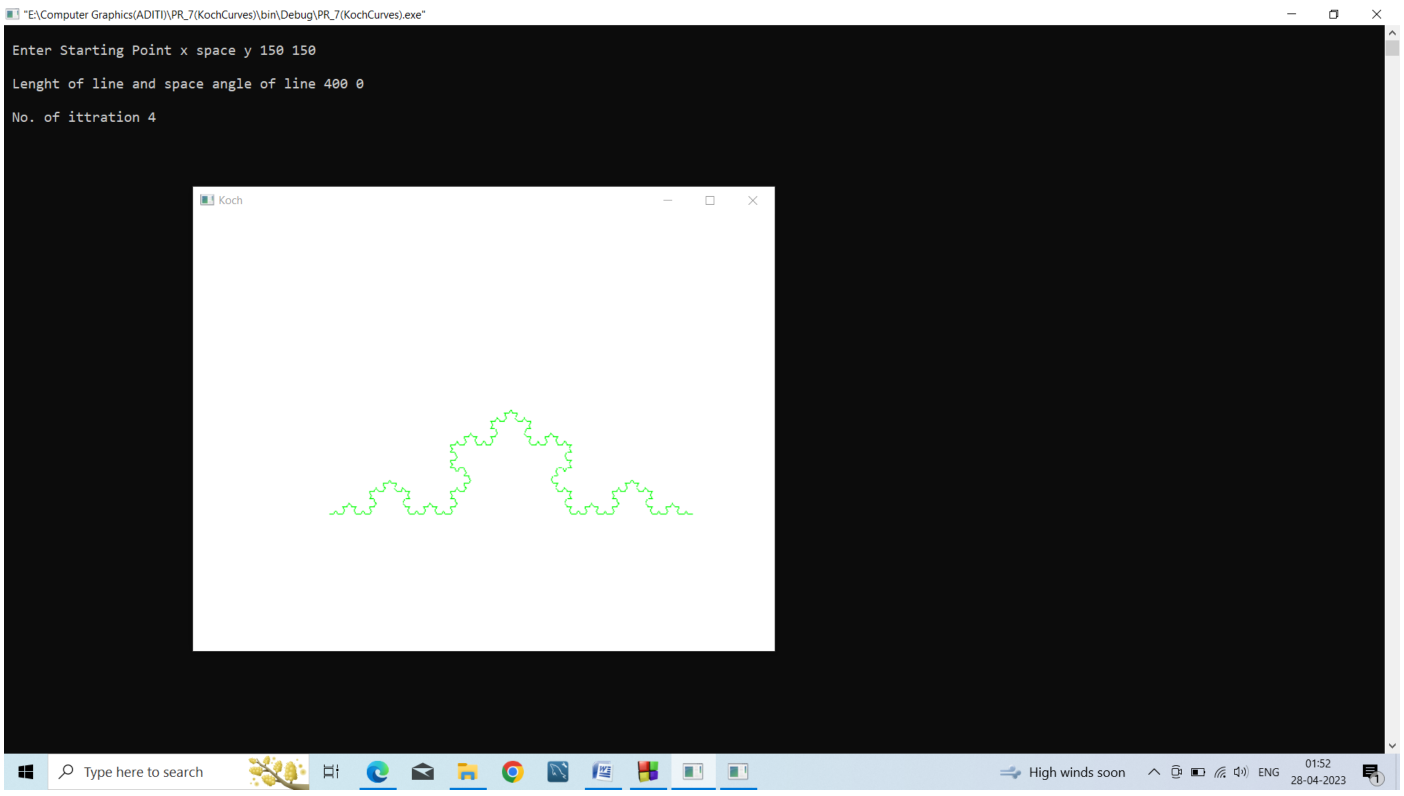
```
"E:\Computer Graphics(ADITI)\PR_7(BezierCurves)\bin\Debug\PR_7(BezierCurves).exe"

        Enter The Four Points x space y
        Enter x and y for 0 = 50 50

        Enter x and y for 1 = 150 150

        Enter x and y for 2 = 250 50

        Enter x and
```

Code: ii) Koch Curve

```
#include <iostream>

#include <math.h>

#include <time.h>

#include <GL/glut.h>

using namespace std;

double x,y,len,angle;

int it;

void init()

{

 glClearColor(1.0,1.0,1.0,0.0);

 glMatrixMode(GL_PROJECTION);

 gluOrtho2D(0,640,0,480);

 glClear(GL_COLOR_BUFFER_BIT);

}

void line1(int x1, int y11, int x2,int y2)

{

 glColor3f(0,1,0);

 glBegin(GL_LINES);

 glVertex2i(x1,y11);

 glVertex2i(x2,y2);

 glEnd();
 glFlush();
}
void k_curve(double x, double y, double len, double angle, int it)
{
 if(it>0){
 len /=3;
 k_curve(x,y,len,angle,(it-1));
 x += (len * cosl(angle * (M_PI)/180));
 y += (len * sinl(angle * (M_PI)/180));
 k_curve(x,y, len, angle+60,(it-1));
 x += (len * cosl((angle + 60) * (M_PI)/180));
 y += (len * sinl((angle + 60) * (M_PI)/180));
 k_curve(x,y, len, angle-60,(it-1));
 x += (len * cosl((angle - 60) * (M_PI)/180));
 y += (len * sinl((angle - 60) * (M_PI)/180));
 k_curve(x,y,len,angle,(it-1));
 }
 else
 {
 line1(x,y,(int)(x + len * cosl(angle * (M_PI)/180) + 0.5),(int)(y + len *
sinl(angle * (M_PI)/180) + 0.5));
 }
}
```

```
void Algorithm()
{
 k_curve(x,y,len,angle,it);
}
int main(int argc, char** argv)
{
 cout<<"\n Enter Starting Point x space y ";
 cin>>x>>y;
 cout <<"\n Lenght of line and space angle of line";
 cin>>len>>angle;
 cout<<"\n No. of ittration ";
 cin>>it;
 glutInit(&argc, argv);
 glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
 glutInitWindowSize(640,480);
 glutInitWindowPosition(200,200);
 glutCreateWindow("Koch");
 init();
 glutDisplayFunc(Algorithm);
 glutMainLoop();
 return 0;
}
```

Output:



"E:\Computer Graphics(ADITI)\PR_7(KochCurves)\bin\Debug\PR_7(KochCurves).exe"
Koch
Type here to search
High winds soon
ENG
01:52
28-04-2023

```
Enter Starting Point x space y 150 150

Lenght of line and space angle of line 400 0

No. of ittration 4
```