8. Develop a menu driven program to animate a flag using Bezier curve algorithm.

```
#include<GL/glut.h>
#include<stdio.h>
#include<math.h>
#define PI 3.1416

static int win,val=0,CMenu;
void CreateMenu(void);
void Menu(int value);
struct wcPt3D
{
      GLfloat x, y, z;
};
      GLsizei winWidth = 600, winHeight = 600;
      GLfloat xwcMin = 0.0, xwcMax = 130.0;
      GLfloat ywcMin = 0.0, ywcMax = 130.0;
void bino(GLint n, GLint *C)
{
      GLint k, j;
      for(k=0;k<=n;k++)
{
      C[k]=1;
      for(j=n;j>=k+1; j--)
      C[k]*=j;
      for(j=n-k;j>=2;j--)
      C[k]/=j;
}
}
void computeBezPt(GLfloat u,struct wcPt3D *bezPt, Glint nCtrlPts,
struct wcPt3D *ctrlPts, GLint *C)
{
      GLint k, n=nCtrlPts-1;
      GLfloat bezBlendFcn;
      bezPt ->x =bezPt ->y = bezPt->z=0.0;
      for(k=0; k< nCtrlPts; k++)
      {
            bezBlendFcn = C[k] * pow(u, k) * pow( 1-u, n-k);
            bezPt ->x += ctrlPts[k].x * bezBlendFcn;
            bezPt ->y += ctrlPts[k].y * bezBlendFcn;
            bezPt ->z += ctrlPts[k].z * bezBlendFcn;
      }
}
void bezier(struct wcPt3D *ctrlPts, GLint nCtrlPts, GLint
nBezCurvePts)
{
      struct wcPt3D bezCurvePt;
      GLfloat u;
      GLint *C, k;
      C= new GLint[nCtrlPts];
      bino(nCtrlPts-1, C);
```

```
	glBegin(GL_LINE_STRIP);
	for(k=0; k<=nBezCurvePts; k++)
	{
		u=GLfloat(k)/GLfloat(nBezCurvePts);
		computeBezPt(u, &bezCurvePt, nCtrlPts, ctrlPts, C);
		glVertex2f(bezCurvePt.x, bezCurvePt.y);
	}
	glEnd();
	delete[]C;
}
void displayFcn()
{
	GLint nCtrlPts = 4, nBezCurvePts =20;
	static float theta = 0;
	struct wcPt3D ctrlPts[4] = {{20, 100, 0},{30, 110, 0},{50, 90,
	0},{60, 100, 0}};
	ctrlPts[1].x +=10*sin(theta * PI/180.0);
	ctrlPts[1].y +=5*sin(theta * PI/180.0);
	ctrlPts[2].x -= 10*sin((theta+30) * PI/180.0);
	ctrlPts[2].y -= 10*sin((theta+30) * PI/180.0);
	ctrlPts[3].x-= 4*sin((theta) * PI/180.0);
	ctrlPts[3].y += sin((theta-30) * PI/180.0);
	theta+=0.1;
	glClear(GL_COLOR_BUFFER_BIT);
	glColor3f(1.0, 1.0, 1.0);
	glPointSize(5);
//Indian Flag
	if(val==1){
	glPushMatrix();
	glLineWidth(5);
	glColor3f(1.0,0.5,0); //Indian flag: Orange color code
	for(int i=0;i<8;i++)
	{
	glTranslatef(0, -0.8, 0);
	bezier(ctrlPts, nCtrlPts, nBezCurvePts);
	}
	glColor3f(1,1,1); //Indian flag: white color code
	for(int i=0;i<8;i++)
	{
	glTranslatef(0, -0.8, 0);
	bezier(ctrlPts, nCtrlPts, nBezCurvePts);
	}
	glColor3f(0,1.0,0); //Indian flag: green color code
	for(int i=0;i<8;i++)
	{
	glTranslatef(0, -0.8, 0);
	bezier(ctrlPts, nCtrlPts, nBezCurvePts);
	}
	glPopMatrix();
	glColor3f(0.7, 0.5,0.3);
	glLineWidth(5);
```

```
glBegin(GL_LINES);
glVertex2f(20,100);
glVertex2f(20,40);
glEnd();
glFlush();
}
//Karnataka Flag
      if(val==2){
      glPushMatrix();
      glLineWidth(5);
      glColor3f(1.0, 1.0, 0.0); //Karnataka flag: Yellow color code
      for(int i=0;i<12;i++)
      {
      glTranslatef(0, -0.8, 0);
      bezier(ctrlPts, nCtrlPts, nBezCurvePts);
      }
      glColor3f(1, 0.0, 0.0); //Karnataka flag: Red color code
      for(int i=0;i<12;i++)
      {
      glTranslatef(0, -0.8, 0);
      bezier(ctrlPts, nCtrlPts, nBezCurvePts);
      }
      glPopMatrix();
      glColor3f(0.7, 0.5,0.3);
      glLineWidth(5);
      glBegin(GL_LINES);
      glVertex2f(20,100);
      glVertex2f(20,40);
      glEnd();
      glFlush();
      }
glutPostRedisplay();
glutSwapBuffers();
}
void winReshapeFun(GLint newWidth, GLint newHeight)
{
      glViewport(0, 0, newWidth, newHeight);
      glMatrixMode(GL_PROJECTION);
      glLoadIdentity();
      gluOrtho2D(xwcMin, xwcMax, ywcMin, ywcMax);
      glClear(GL_COLOR_BUFFER_BIT);
}
void CreateMenu(void)
{
      CMenu= glutCreateMenu(Menu);//Creaate Menu Option
      glutAddMenuEntry("Indian Flag",1);
      glutAddMenuEntry("Karnataka Flag",2);
      glutAddMenuEntry("Exit",0);
      glutAttachMenu(GLUT_RIGHT_BUTTON);
}
void Menu(int value)
{
```

```
      if(value==0)
{
      glutDestroyWindow(win);
      exit(0);
}
      else {
      val=value;
      }
}
int main(int argc, char **argv)
{
      glutInit(&argc, argv);
      glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB);
      glutInitWindowPosition(50, 50);
      glutInitWindowSize(winWidth, winHeight);
      glutCreateWindow("Prg. 8 Bezier Curve");
      CreateMenu();
      glutDisplayFunc(displayFcn);
      glutReshapeFunc(winReshapeFun);
      glutMainLoop();
}
```

OUTPUT: