PROGRAM 4

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Class:-Second Year Engineering Comp-1

Roll No:- 20

Write a C++ program to draw a 2D object and perform the following transformations:- 1. Scaling 2. Translation 3. Rotation

PROGRAM:-

```
#include<iostream.h>

#include<math.h>

#include<graphics.h>

#include<conio.h>

class translation

{

int val;

public:

void setvalue(int temp)

{

val=temp;

}

int disp()

{

return(val);

}

translation operator+(translation o)
```

```
{
translation t;
t.val=val+o.val;
return(t);
}
};
class scale
{
int val;
public:
void setvalue(int temp){ val=temp;
}
int disp()
{
return(val);
}
scale operator*(scale o)
{
scale s;
s.val=val*o.val;
return(s);
}
};
class rotation
```

```
{
public:
float b[3][3],a[3][3];
int x1,y1,x2,y2,x3,y3;
rotation()
{
x1=100,y1=100,x2=300,y2=100,x3=150,y3=50;
}
rotation ret()
{
rotation t1;
t1.b[0][0]=x1;
t1.b[0][1]=y1;
t1.b[0][2]=0;
t1.b[1][0]=x2;
t1.b[1][1]=y2;
t1.b[1][2]=0;
t1.b[2][0]=x3;
t1.b[2][1]=y3;
t1.b[2][2]=1;
return(t1);
}
rotation ret1()
{
```

```
rotation t2;
float t;
float a1,a2,a3;
t=45;
t=t*3.14/180;
a1=cos(t);
a2=sin(t);
a3=-sin(t);
t2.a[0][0]=a1;
t2.a[0][1]=a2;
t2.a[0][2]=0;
t2.a[1][0]=a3;
t2.a[1][1]=a1;
t2.a[1][2]=0;
t2.a[2][0]=0;
t2.a[2][1]=0;
t2.a[2][2]=1;
return(t2);
}
rotation operator*(rotation o)
{
rotation t;
t.b[0][0]=((b[0][0]*o.a[0][0])+(b[0][1]*o.a[1][0])+(b[0][2]*o.a[2][0]));
t.b[0][1]=((b[0][0]*o.a[0][1])+(b[0][1]*o.a[1][1])+(b[0][2]*o.a[2][1]));
```

```
t.b[0][2]=((b[0][0]*o.a[0][2])+(b[0][1]*o.a[1][2])+(b[0][2]*o.a[2][2]));
t.b[1][0]=((b[1][0]*o.a[0][0])+(b[1][1]*o.a[1][0])+(b[1][2]*o.a[2][0]));
t.b[1][1]=((b[1][0]*o.a[0][1])+(b[1][1]*o.a[1][1])+(b[1][2]*o.a[2][1]));
t.b[1][2]=((b[1][0]*o.a[0][2])+(b[1][1]*o.a[1][2])+(b[1][2]*o.a[2][2]));
t.b[2][0]=((b[2][0]*o.a[0][0])+(b[2][1]*o.a[1][0])+(b[2][2]*o.a[2][0]));
t.b[2][1]=((b[2][0]*o.a[0][0])+(b[2][1]*o.a[1][0])+(b[2][2]*o.a[2][0]));
t.b[2][2]=((b[2][0]*o.a[0][0])+(b[2][1]*o.a[1][0])+(b[2][2]*o.a[2][0]));
return(t);
}
};
int main()
{
int gd=DETECT,gm=0;
int ch,flag=0;
int x1=100,y1=100,x2=300,y2=100,x3=150,y3=50,tx=50,ty=50; int
a1=100,b1=100,a2=300,b2=100,a3=150,b3=50,sx=2,sy=3;
translation t1,t2,t3,t4,t5,t6,t7,t8;
rotation r1,r2,r3,r4;
scale s1,s2,s3,s4,s5,s6,s7,s8;
do
{
cout<<"\n\t\t MENU";
cout<<"\n 1.Translation \n 2.Scaling \n 3.Rotation\n 4.Exit \n Please Enter Your Choice:";
cin>>ch;
```

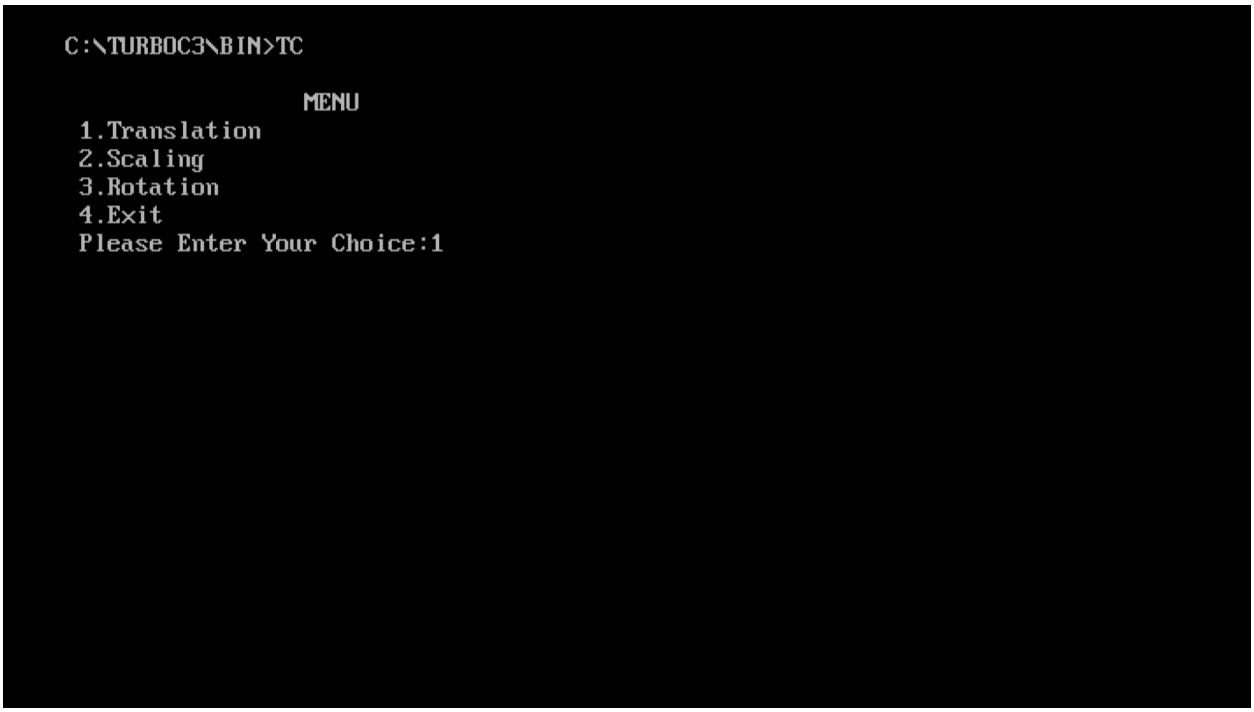
```
switch(ch)
{
case 1:
{
initgraph(&gd,&gm,"C://turboc3//bgi");
t1.setvalue(x1);
t2.setvalue(y1);
t3.setvalue(x2);
t4.setvalue(y2);
t5.setvalue(x3);
t6.setvalue(y3);
line(x1,y1,x2,y2);
line(x2,y2,x3,y3);
line(x1,y1,x3,y3);
t7.setvalue(tx);
t8.setvalue(ty);
setcolor(GREEN);
t1=t1+t7;
t2=t2+t8;
t3=t3+t7;
t4=t4+t8;
t5=t5+t7;
t6=t6+t8;
line(t1.disp(),t2.disp(),t3.disp(),t4.disp());
```

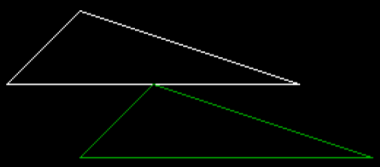
```
line(t3.disp(),t4.disp(),t5.disp(),t6.disp());
line(t1.disp(),t2.disp(),t5.disp(),t6.disp());
break;
}
case 2:
{
initgraph(&gd,&gm,"C://turboc3//bgi");
s1.setvalue(a1);
s2.setvalue(b1);
s3.setvalue(a2);
s4.setvalue(b2);
s5.setvalue(a3);
s6.setvalue(b3);
line(a1,b1,a2,b2);
line(a2,b2,a3,b3);
line(a1,b1,a3,b3);
s7.setvalue(sx); s8.setvalue(sy);
setcolor(GREEN);
s1=s1*s7;
s2=s2*s8;
s3=s3*s7;
s4=s4*s8;
s5=s5*s7;
s6=s6*s8;
```

```
line(s1.disp(),s2.disp(),s3.disp(),s4.disp());
line(s3.disp(),s4.disp(),s5.disp(),s6.disp());
line(s1.disp(),s2.disp(),s5.disp(),s6.disp());
break;
}
case 3:
{
initgraph(&gd,&gm,"C://turboc3//bgi");
r2=r1.ret();
r3=r1.ret1();
int nx1,ny1,nx2,ny2,nx3,ny3; r4=r2*r3;
nx1=r4.b[0][0];
ny1=r4.b[0][1];
nx2=r4.b[1][0];
ny2=r4.b[1][1];
nx3=r4.b[2][0];
ny3=r4.b[2][1];
line(nx1,ny1,nx2,ny2); line(nx2,ny2,nx3,ny3); line(nx3,ny3,nx1,ny1);
break;
}
case 4:
{
flag=1;
cout<<"\n\t Thank YOU";
```

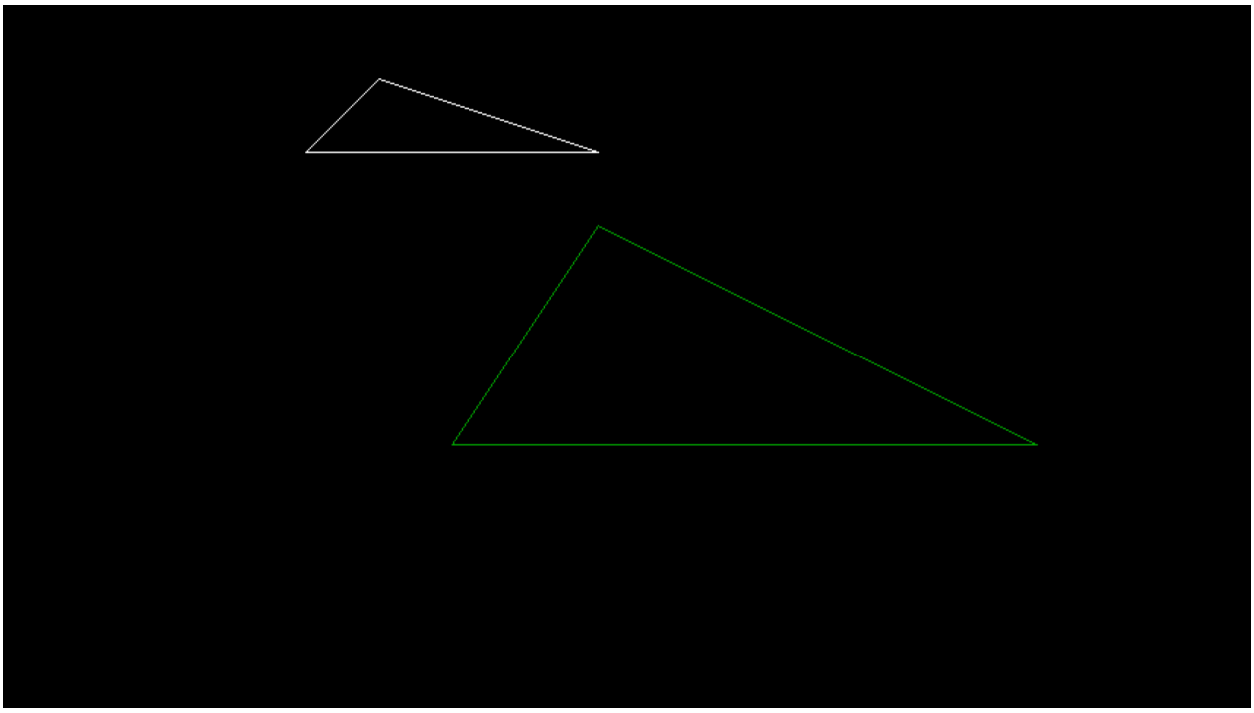
```
break;

}

default:

 cout<<"\n\t INVALID";

 break;

}

getch();

closegraph();

}while(flag==0);

return 0;

}
```

OUTPUT:-

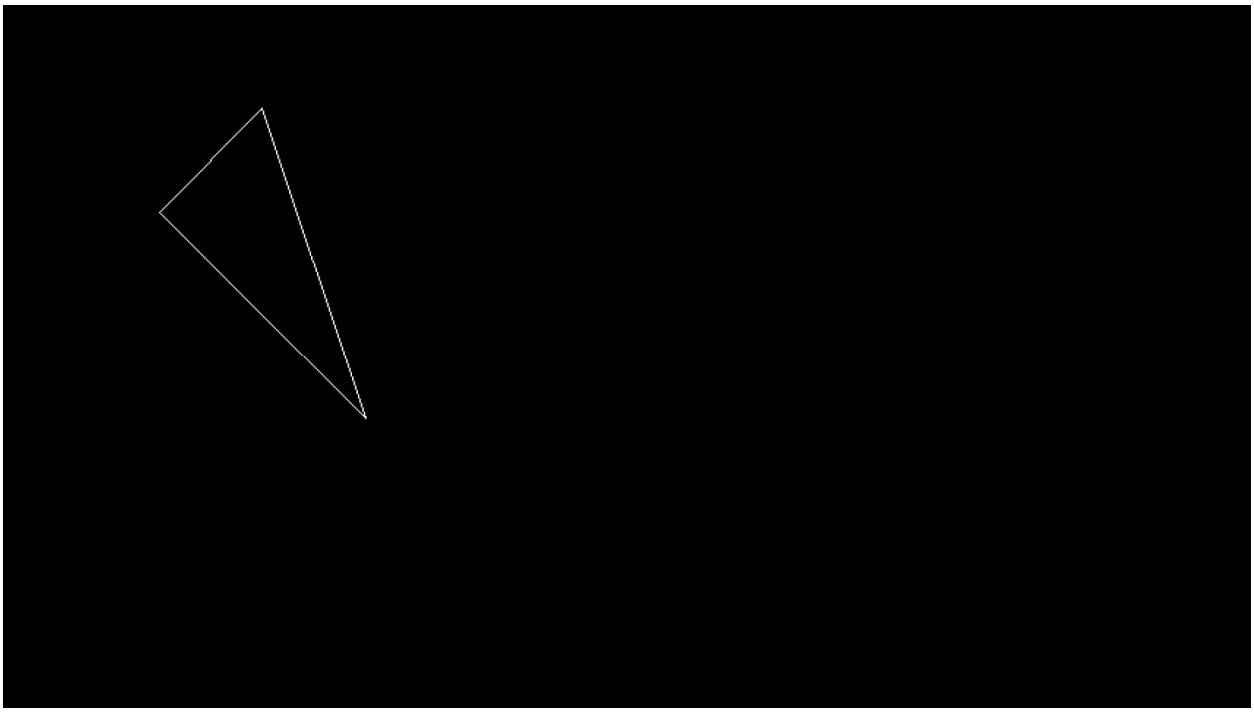




```
C:\TURBOC3\BIN>TC

                MENU
 1.Translation
 2.Scaling
 3.Rotation
 4.Exit
 Please Enter Your Choice:2
```



```
C:\TURBOC3\BIN>TC

                MENU
 1.Translation
 2.Scaling
 3.Rotation
 4.Exit
 Please Enter Your Choice:3_
```



```
C:\TURBOC3\BIN>TC

                MENU
 1.Translation
 2.Scaling
 3.Rotation
 4.Exit
 Please Enter Your Choice:4

         Thank YOU
```

PROGRAM 5

Name:- Kaustubh S Kabra

Class:-Second Year Engineering Comp-1

Roll No:- 20

Write a C++ program to generate Hilbert curve using concepts of fractals.

PROGRAM:-

```
#include<iostream.h>
#include<conio.h>
#include<stdio.h>
#include<graphics.h>
#include<math.h>
#include<stdlib.h>
void move(int j,int h,int &x,int &y)
{
 if(j==1)
y-=h;
 else if(j==2)
x+=h;
 else if(j==3)
y+=h;
 else if(j==4)
x-=h;
 lineto(x,y);
}
void hilbert(int r,int d,int l,int u,int i,int h,int &x,int &y)
```

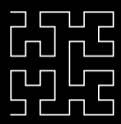
```
{
 if(i>0)
 {
i--;
hilbert(d,r,u,l,i,h,x,y);
move(r,h,x,y);
hilbert(r,d,l,u,i,h,x,y);
move(d,h,x,y);
hilbert(r,d,l,u,i,h,x,y);
move(l,h,x,y);
hilbert(u,l,d,r,i,h,x,y);
 }
}
int main()
{
 int n,x1,y1;
 int x0=20,y0=50,x,y,h=10,r=2,d=3,l=4,u=1;
 cout<<endl<<"Enter n: ";
 cin>>n;
 x=x0;
 y=y0;
 int gd=DETECT,gm;
 initgraph(&gd,&gm,"C://turboc3//bgi");
 moveto(x,y);
 hilbert(r,d,l,u,n,h,x,y);
 getch();
 closegraph();
 return 0;
```

```
}
```

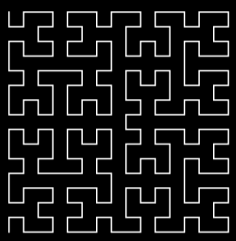
OUTPUT:-

```
C:\TURBOC3\BIN>TC

Enter n: 2
```

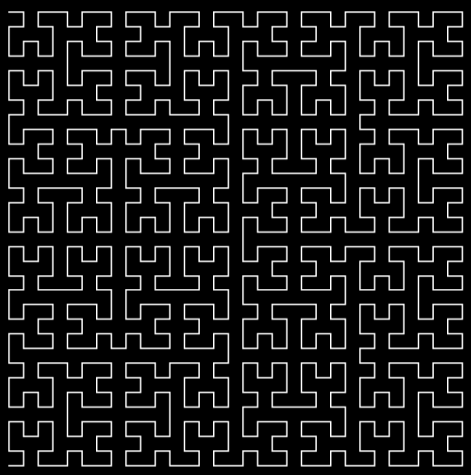
```
C:\TURBOC3\BIN>TC

Enter n: 3
```



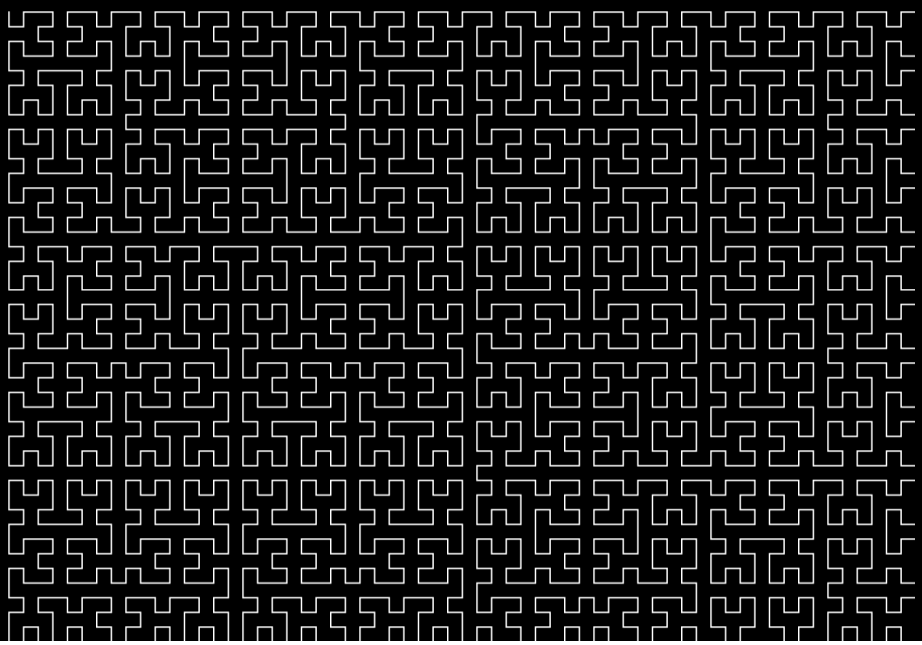
```
C:\TURBOC3\BIN>TC

Enter n: 4
```



```
C:\TURBOC3\BIN>TC

Enter n: 5
```



```
C:\TURBOC3\BIN>TC

Enter n: 6_
```



PROGRAM 6

Name:- Kaustubh S Kabra

Class:-Second Year Engineering Comp-1

Roll No:- 20

Write C++ program to simulate any one of or similar scene

a) Clock with pendulum OR

b) National Flag hoisting OR

c) Vehicle/boat locomotion OR

d) Water drop falling into the water and generated waves after impact

PROGRAM:-

```
#ifdef __APPLE__
#include <GLUT/glut.h>
#else
#include <GL/glut.h>
#endif
#include<stdio.h>
#include<math.h>
#include<stdlib.h>

int i, j = 0;
char st1[] = "Vande Mataram";
float w = 0.0, h = 0.0, x, y, z;
void filcircle(float x, float y, float r)
{
        float angle = 0;
        glBegin(GL_TRIANGLE_FAN);
        while (angle < 360)
```

```
	{
		glVertex2f(x + sin(angle) * r, y + cos(angle) * r);
		angle += 1.0;
	}
	glEnd();

}



void curves2(float x1, float y1, float x2, float y2, float a1, float a2, float b1, float b2)
{
	GLfloat cp[4][3] = { {x1,y1},{a1,a2},{b1,b2},{x2,y2} };
	glMap1f(GL_MAP1_VERTEX_3, 0.0, 1.0, 3, 4, *cp);
	glEnable(GL_MAP1_VERTEX_3);
	GLint k;
	float c = 0.3;

	glLineWidth(2);
	glBegin(GL_LINE_STRIP);
	for (k = 0; k <= 50; k++)
	{

		glEvalCoord1f(GLfloat(k) / 50.0);
	}
	glEnd();

	glColor3f(0.15, .3, 0.65);
	glBegin(GL_POINTS);
	for (k = 0; k < 4; k++)
		glVertex2fv(&cp[k][0]);
	glEnd();
}


void drawline(float x0, float y0, float x1, float y1)
{
```

```
	glBegin(GL_LINES);
	glVertex2f(x0, y0);
	glVertex2f(x1, y1);
	glEnd();
	glFlush();
}




void drawrect(float xmin, float xmax, float ymin, float ymax)
{
	glBegin(GL_QUADS);
	glVertex2f(xmin, ymin);
	glVertex2f(xmin, ymax);
	glVertex2f(xmax, ymax);
	glVertex2f(xmax, ymin);
	glEnd();
	glFlush();
}

void draw_pixels(int cx, int cy)
{
	glPointSize(5.0);
	glBegin(GL_POINTS);
	glVertex2i(cx, cy);
	glEnd();
	glFlush();
}

void plotpixels(int h, int k, int x, int y)
{
	draw_pixels(x + h, y + k);
	draw_pixels(-x + h, y + k);
	draw_pixels(x + h, -y + k);
	draw_pixels(-x + h, -y + k);
```

```
	draw_pixels(y + h, x + k);
	draw_pixels(-y + h, x + k);
	draw_pixels(y + h, -x + k);
	draw_pixels(-y + h, -x + k);
}

void drawcircle(int h, int k, int r)
{
	int d = 1 - r, x = 0, y = r;
	while (y > x)
	{
		plotpixels(h, k, x, y);
		if (d < 0)
			d += 2 * x + 3;
		else
		{
			d += 2 * (x - y) + 5;
			--y;
		}
		++x;
	}
	plotpixels(h, k, x, y);
}




void init()
{
	glClearColor(0.15, .3, .65, 1);
	glMatrixMode(GL_PROJECTION);
	glLoadIdentity();

}

void sun()
{
```

```
	//drawing a sun
	glColor3f(1, 1, 0);
	glLineWidth(2);
	glBegin(GL_LINES);
	glVertex2f(60, 63);
	glVertex2f(100, 63);
	glVertex2f(80, 50);
	glVertex2f(80, 80);
	glVertex2f(70, 77);
	glVertex2f(90, 50);
	glVertex2f(70, 50);
	glVertex2f(90, 77);
	glVertex2f(65, 70);
	glVertex2f(95, 55);
	glVertex2f(65, 55);
	glVertex2f(95, 70);
	glEnd();
	float angle = 0;
	glColor3f(1, .7, 0);
	glBegin(GL_TRIANGLE_FAN);
	while (angle < 360)
	{
		glVertex2f(80 + sin(angle) * 10, 65 + cos(angle) * 10);
		angle += 1.0;
	}
	glEnd();


}




void draw_flag()
{
```

```
	//steps
	glColor3f(1.5, 1.5, 1.5);
	drawrect(-100, -60, -75, -70);
	drawrect(-95, -65, -70, -65);

	//pole
	glColor3f(0.0, 0.0, 0.0);
	glLineWidth(8.0);
	drawline(-80, -65, -80, 55);
	//rope
	glColor3f(1.0, 1.0, 1.0);
	glLineWidth(0.2);
	curves2(-80, -40, -80, 55, -83, -30, -83, 40);
	//folded flag
	glColor3f(1.0, 1.0, 0.0);
	drawrect(-80, -75, -42, -38);
	//tierope
	glColor3f(1.0, 1.0, 1.0);
	glLineWidth(0.2);
	drawline(-80, -40, -75, -40);

	//hook
	glColor3f(0.0, 0.0, 0.0);
	draw_pixels(-80, 55);
}



void draw_people()
{
	int j = 0;
	float k = 0;
	for (int i = 0; i < 3; i++)
	{

		//person head
		glColor3f(0.75, 0.75, 1);
```

```
                filcircle(40 + j, -30, 6);

                //neck
                drawrect(38 + j, 42 + j, -40, -35);
                //eye
                glColor3f(0, 0, 0);
                draw_pixels(38 + j, -28);
                draw_pixels(42 + j, -28);
                glLineWidth(2.0);
                drawline(38 + j, -32.5, 42 + j, -32.5);
                //body
                glColor3f(1 + k, 0.1 + k, 0.2 + k);
                drawrect(33 + j, 47 + j, -60, -40);
                //hands
                glColor3f(0 + k, 0.75 + k, 1 + k);
                drawrect(30 + j, 33 + j, -50, -40);
                drawrect(47 + j, 50 + j, -50, -40);
                glColor3f(0.75, 0.75, 1);
                drawrect(30 + j, 33 + j, -65, -50);
                drawrect(47 + j, 50 + j, -65, -50);
                //legs
                glColor3f(0 + k, .75 + k, 1 + k);
                drawrect(35 + j, 40 + j, -75, -60);
                drawrect(40 + j, 45 + j, -75, -60);
                glColor3f(0, 0, 0);
                drawline(40 + j, -75, 40 + j, -60);
                j = j + 25;
                k += .3;
        }

}


void printc(int x, int y, char st[])
{
        char* p = st;
        float i = 0;
        while (*p != '\0')
```

```
	{
		glRasterPos2i(x + i, y);
		glutBitmapCharacter(GLUT_BITMAP_TIMES_ROMAN_24, *p);
		i += 5;
		p++;
	}
	glFlush();
}



void reshape(int w, int h)
{
	glViewport(0, 0, (GLsizei)w, (GLsizei)h);
	glMatrixMode(GL_PROJECTION);
	glLoadIdentity();
	if (w <= h)
		gluOrtho2D(-100.0, 100.0, -80.0 * (GLfloat)h / (GLfloat)w,
			80.0 * (GLfloat)h / (GLfloat)w);
	else
		gluOrtho2D(-100.0 * (GLfloat)w / (GLfloat)h,
			100.0 * (GLfloat)w / (GLfloat)h, -80.0, 80.0);
	glMatrixMode(GL_MODELVIEW);
	glLoadIdentity();

	glutPostRedisplay();

}



void salute()
{
	int j = 0, i;
	float k = .3;
	for (i = 0; i < 2; i++)
	{
		glColor3f(.15, 0.3, 0.65);
```

```
                drawrect(55 + j, 58 + j, -50, -40);
                drawrect(55 + j, 58 + j, -65, -50);
                //person second
                glColor3f(0 + k, 0.75 + k, 1 + k);
                glBegin(GL_QUADS);
                glVertex2f(51 + j, -40);
                glVertex2f(58 + j, -40);
                glVertex2f(58 + j, -43);
                glVertex2f(51 + j, -43);
                glEnd();
                glFlush();
                glColor3f(0.75, 0.75, 1);
                glBegin(GL_QUADS);
                glVertex2f(51 + j, -40);
                glVertex2f(54 + j, -40);
                glVertex2f(61 + j, -34);
                glVertex2f(59 + j, -32);
                glEnd();
                glFlush();
                j = j + 25;
                k += .3;
        }

        glColor3f(1, 1, 1);
        printc(17, 40, st1);


}


void flaghoist()
{
        //flag
        glColor3f(1, 0.25, 0);
        drawrect(-80, -40, 49, 56);
        glColor3f(1, 1, 1);
        drawrect(-80, -40, 42, 49);
        glColor3f(0, 1, 0);
```

```
        drawrect(-80, -40, 35, 42);
        glColor3f(0, 0, 1);
        drawcircle(-60, 45.5, 3.5);


        drawline(-60, 45.5, -56.5, 45.5);
        drawline(-60, 45.5, -60, 48.5);
        drawline(-60, 45.5, -60, 41.5);
        drawline(-60, 45.5, -63.5, 45.5);
        drawline(-60, 45.5, -58, 47);
        drawline(-60, 45.5, -62, 47);
        drawline(-60, 45.5, -58, 42.5);
        drawline(-60, 45.5, -62, 42.5);



        salute();
}



void move_flag()
{
        //hand movement
        glColor3f(0.15, 0.3, 0.65);
        drawrect(-70, -67, -65, -50);
        glColor3f(0.75, 0.75, 1);
        glBegin(GL_QUADS);
        glVertex2f(-77, -40);
        glVertex2f(-78, -42);
        glVertex2f(-70, -47);
        glVertex2f(-70, -50);
        glEnd();
        glFlush();


        //flag movement
        float i = 0, j = 0;
```

```
        while (i < 80.5)
        {
                glColor3f(0.15, 0.3, 0.65);
                drawrect(-80, -75, -42 + i, -38 + i);
                i = i + .15;
                j = i;
                glColor3f(1.0, 1.0, 0.0);
                drawrect(-80, -75, -42 + j, -38 + j);

        }
        glColor3f(.15, 0.3, 0.65);
        curves2(-80, -40, -80, 55, -83, -30, -83, 40);
        //pole
        glColor3f(0.0, 0.0, 0.0);
        glLineWidth(8.0);
        drawline(-80, -65, -80, 55);

        glColor3f(1.0, 1.0, 1.0);
        glLineWidth(0.2);
        curves2(-75, -50, -80, 55, -65, -35, -95, 40);


        //untie rope

        glBegin(GL_LINES);
        glVertex2f(-78.50, -50);
        glVertex2f(-74, -43);
        glEnd();
        glFlush();
        glBegin(GL_LINES);
        glVertex2f(-80, -40);
        glVertex2f(-74, -43);
        glEnd();
        glFlush();
        flaghoist();
}
```

```
void move_person()
{

	int i = 0;
	while (i < 100)
	{

		//1st person head
		glColor3f(0.15, .3, .65);
		filcircle(40 - i, -30, 6);

		//neck
		drawrect(38 - i, 42 - i, -40, -35);
		//eye

		draw_pixels(38 - i, -28);
		draw_pixels(42 - i, -28);

		drawline(38 - i, -32.5, 42 - i, -32.5);
		//body
		drawrect(33 - i, 47 - i, -60, -40);
		//hands
		drawrect(30 - i, 33 - i, -50, -40);
		drawrect(47 - i, 50 - i, -50, -40);
		drawrect(30 - i, 33 - i, -65, -50);
		drawrect(47 - i, 50 - i, -65, -50);
		//legs
		drawrect(35 - i, 40 - i, -75, -60);
		drawrect(40 - i, 45 - i, -75, -60);
		drawline(40 - i, -75, 40 - i, -60);

		i = i + 5;
		j = i;
		//1st person head
		glColor3f(0.75, 0.75, 1);
		filcircle(40 - j, -30, 6);

		//neck
```

```
                drawrect(38 - j, 42 - j, -40, -35);

                //eye
                glColor3f(0, 0, 0);
                draw_pixels(38 - j, -28);
                draw_pixels(42 - j, -28);
                glLineWidth(2.0);
                drawline(38 - j, -32.5, 42 - j, -32.5);
                //body
                glColor3f(1, 0.1, 0.2);
                drawrect(33 - j, 47 - j, -60, -40);
                //hands
                glColor3f(0, 0.75, 1);
                drawrect(30 - j, 33 - j, -50, -40);
                drawrect(47 - j, 50 - j, -50, -40);
                glColor3f(0.75, 0.75, 1);
                drawrect(30 - j, 33 - j, -65, -50);

                drawrect(47 - j, 50 - j, -65, -50);
                //legs
                glColor3f(0, .75, 1);
                drawrect(35 - j, 40 - j, -75, -60);
                drawrect(40 - j, 45 - j, -75, -60);
                glColor3f(0, 0, 0);
                drawline(40 - j, -75, 40 - j, -60);
        }
        move_flag();
}



void display()
{
        glClear(GL_COLOR_BUFFER_BIT);
        sun();
        draw_flag();
        draw_people();
```

```
}



void keys(unsigned char key, int x, int y)
{
	if (key == 's' || key == 'S')
		move_person();
	if (key == 27)
		exit(0);
}

int main(int argc, char** argv)
{
	glutInit(&argc, argv);
	glutInitDisplayMode(GLUT_RGB | GLUT_SINGLE);
	glutInitWindowSize(1000, 700);
	glutInitWindowPosition(0, 0);
	glutCreateWindow("Flag Hoisting Ceremony");
	glutDisplayFunc(display);
	glutReshapeFunc(reshape);
	init();
	glutKeyboardFunc(keys);
	glutMainLoop();
}
```

OUTPUT:-