

## Experiment 6

Program Code:-

```
#include<iostream>

#include<math.h>

#include<GL/glut.h>

using namespace std;

typedef float Matrix4 [4][4];

Matrix4 theMatrix;

static GLfloat input[8][3]=

{

{40,40,-50},{90,40,-50},{90,90,-50},{40,90,-50},

{30,30,0},{80,30,0},{80,80,0},{30,80,0}

};

float output[8][3];

float tx,ty,tz;

float sx,sy,sz;

float angle;

int choice,choiceRot;

void setIdentityM(Matrix4 m)

{

for(int i=0;i<4;i++)

for(int j=0;j<4;j++)

m[i][j]=(i==j);

}

void translate(int tx,int ty,int tz)

{
```

```

for(int i=0;i<8;i++)
{
output[i][0]=input[i][0]+tx;
output[i][1]=input[i][1]+ty;
output[i][2]=input[i][2]+tz;
}
}

void scale(int sx,int sy,int sz)
{
theMatrix[0][0]=sx;
theMatrix[1][1]=sy;
theMatrix[2][2]=sz;
}

void RotateX(float angle) //Parallel to x
{
angle = angle*3.142/180;
theMatrix[1][1] = cos(angle);
theMatrix[1][2] = -sin(angle);
theMatrix[2][1] = sin(angle);
theMatrix[2][2] = cos(angle);
}

void RotateY(float angle) //parallel to y
{
angle = angle*3.14/180;
theMatrix[0][0] = cos(angle);
theMatrix[0][2] = -sin(angle);

```

```

theMatrix[2][0] = sin(angle);
theMatrix[2][2] = cos(angle);
}
void RotateZ(float angle) //parallel to z
{
angle = angle*3.14/180;
theMatrix[0][0] = cos(angle);
theMatrix[0][1] = sin(angle);
theMatrix[1][0] = -sin(angle);
theMatrix[1][1] = cos(angle);
}
void multiplyM()
{
//We Don't require 4th row and column in scaling and rotation
//[8][3]=[8][3]*[3][3] //4th not used
for(int i=0;i<8;i++)
{
for(int j=0;j<3;j++)
{
output[i][j]=0;
for(int k=0;k<3;k++)
{
output[i][j]=output[i][j]+input[i][k]*theMatrix[k][j];
}
}
}
}

```

```

}

void Axes(void)
{
    glColor3f (0.0, 0.0, 0.0); // Set the color to BLACK
    glBegin(GL_LINES); // Plotting X-Axis
    glVertex2s(-1000 ,0);
    glVertex2s( 1000 ,0);
    glEnd();
    glBegin(GL_LINES); // Plotting Y-Axis
    glVertex2s(0 ,-1000);
    glVertex2s(0 , 1000);
    glEnd();
}

void draw(float a[8][3])
{
    glBegin(GL_QUADS);
    glColor3f(0.7,0.4,0.5); //behind
    glVertex3fv(a[0]);
    glVertex3fv(a[1]);
    glVertex3fv(a[2]);
    glVertex3fv(a[3]);
    glColor3f(0.8,0.2,0.4); //bottom
    glVertex3fv(a[0]);
    glVertex3fv(a[1]);
    glVertex3fv(a[5]);
    glVertex3fv(a[4]);
}

```

```
glColor3f(0.3,0.6,0.7); //left
glVertex3fv(a[0]);
glVertex3fv(a[4]);
glVertex3fv(a[7]);
glVertex3fv(a[3]);
glColor3f(0.2,0.8,0.2); //right
glVertex3fv(a[1]);
glVertex3fv(a[2]);
glVertex3fv(a[6]);
glVertex3fv(a[5]);
glColor3f(0.7,0.7,0.2); //up
glVertex3fv(a[2]);
glVertex3fv(a[3]);
glVertex3fv(a[7]);
glVertex3fv(a[6]);
glColor3f(1.0,0.1,0.1);
glVertex3fv(a[4]);
glVertex3fv(a[5]);
glVertex3fv(a[6]);
glVertex3fv(a[7]);
glEnd();
}

void init()
{
glClearColor(1.0,1.0,1.0,1.0); //set backgrond color to white
glOrtho(-454.0,454.0,-250.0,250.0,-250.0,250.0);
```

```

// Set the no. of Co-ordinates along X & Y axes and their gappings
glEnable(GL_DEPTH_TEST);
// To Render the surfaces Properly according to their depths
}
void display()
{
glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
Axes();
glColor3f(1.0,0.0,0.0);
draw(input);
setIdentityM(theMatrix);
switch(choice)
{
case 1:
translate(tx,ty,tz);
break;
case 2:
scale(sx,sy,sz);
multiplyM();
break;
case 3:
switch (choiceRot) {
case 1:
RotateX(angle);
break;
case 2: RotateY(angle);

```

```

break;
case 3:
RotateZ(angle);
break;
default:
break;
}
multiplyM();
break;
}
draw(output);
glFlush();
}
int main(int argc, char** argv)
{
glutInit(&argc,argv);
glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB|GLUT_DEPTH);
glutInitWindowSize(1362,750);
glutInitWindowPosition(0,0);
glutCreateWindow("3D TRANSFORMATIONS");
init();

cout<<"Enter your choice
number:\n1.Translation\n2.Scaling\n3.Rotation\n=>";

cin>>choice;

switch (choice) {
case 1:
cout<<"\nEnter Tx,Ty &Tz: \n";

```

```

cin>>tx>>ty>>tz;
break;
case 2:
cout<<"\nEnter Sx,Sy & Sz: \n";
cin>>sx>>sy>>sz;
break;
case 3:
cout<<"Enter your choice for Rotation about axis:\n1.parallel to X-axis."
<<"(y& z)\n2.parallel to Y-axis.(x& z)\n3.parallel to Z-axis."
<<"(x& y)\n =>";
cin>>choiceRot;
switch (choiceRot) {
case 1:
cout<<"\nEnter Rotation angle: ";
cin>>angle;
break;
case 2:
cout<<"\nEnter Rotation angle: ";
cin>>angle;
break;
case 3:
cout<<"\nEnter Rotation angle: ";
cin>>angle;
break;
default:
break;

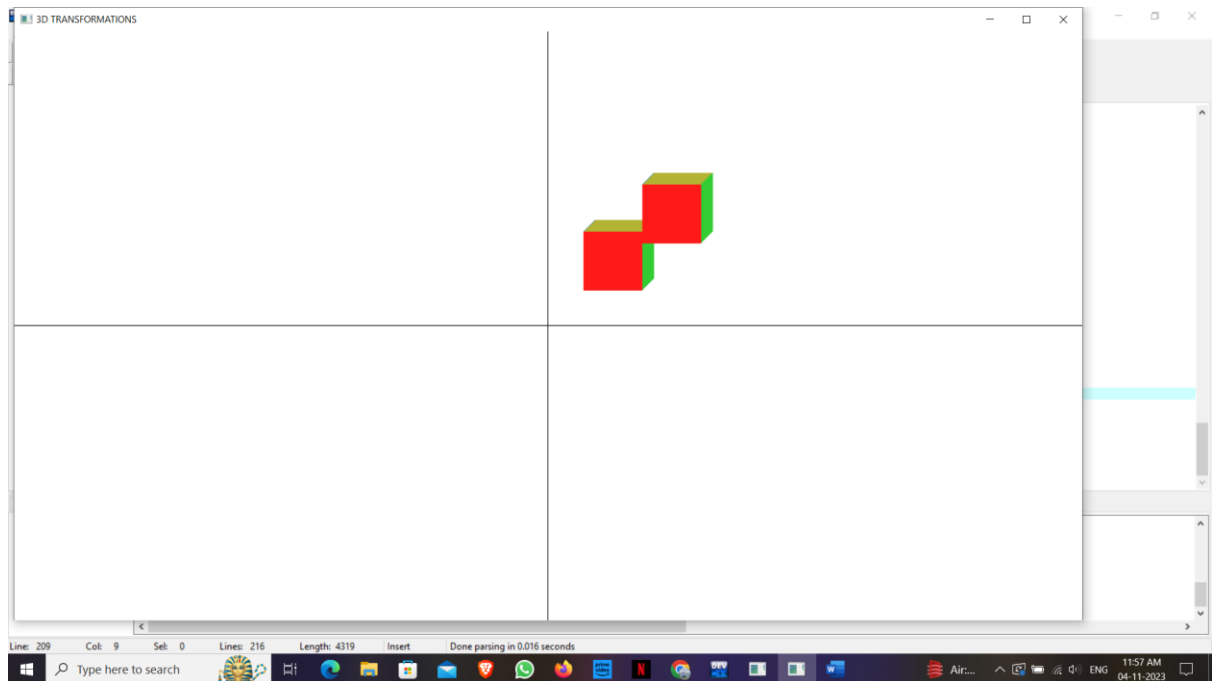
```



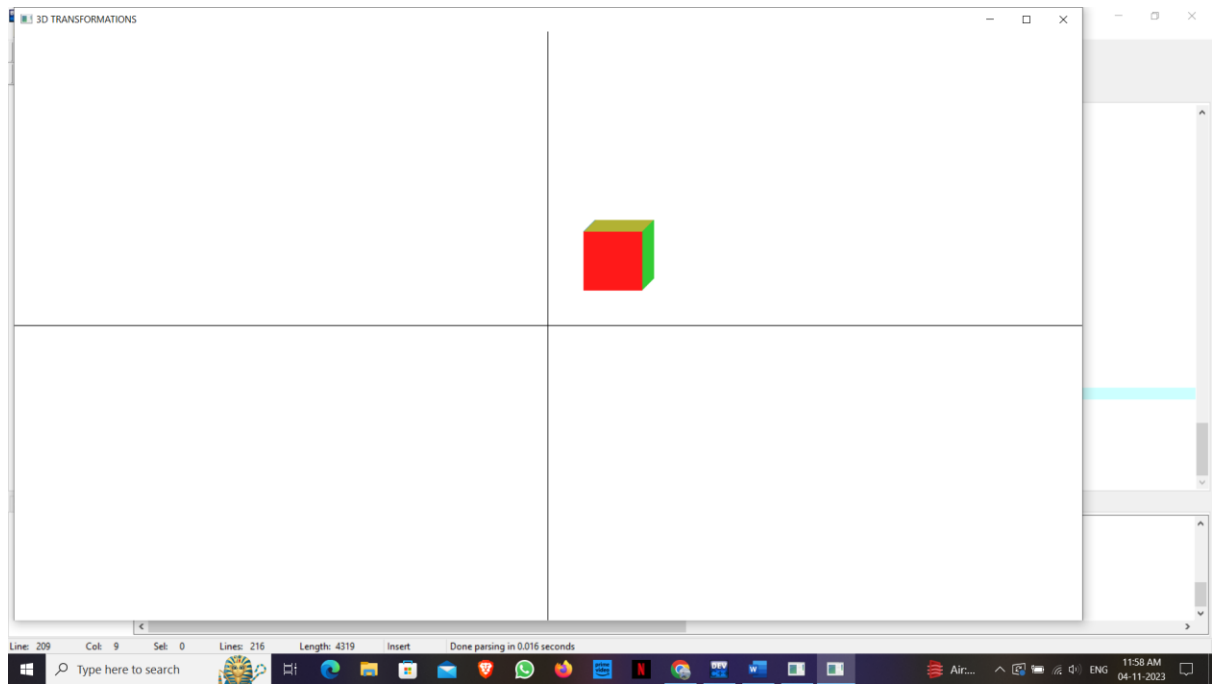
```
}  
break;  
default:  
break;  
}  
glutDisplayFunc(display);  
glutMainLoop();  
return 0;  
}
```

Output:-

### 1) Translation



### 2) Scaling



### 3) Rotation

