CG PRACTICAL FILE

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B.SC. (H.) COMPUTER SCIENCE Semester: 6

1. Write a program to implement Bresenham's line drawing algorithm.

```
#include<stdio.h>
#include<graphics.h>
void drawline(int x0, int y0, int x1, int y1)
{
   int dx, dy, p, x, y;
   dx=x1-x0;
   dy=y1-y0;
   x=x0;
   y=y0;
   p=2*dy-dx;
   while(x<x1)
   {
      if(p>=0)
      {
         putpixel(x,y,7);
         y=y+1;
         p=p+2*dy-2*dx;
      }
      else
      {
         putpixel(x,y,7);
         p=p+2*dy;}
         x=x+1;
      }
}
int main()
{
   int gdriver=DETECT, gmode, error, x0, y0, x1, y1;
   initgraph(&gdriver, &gmode, NULL);
   printf("Enter co-ordinates of first point: ");
```

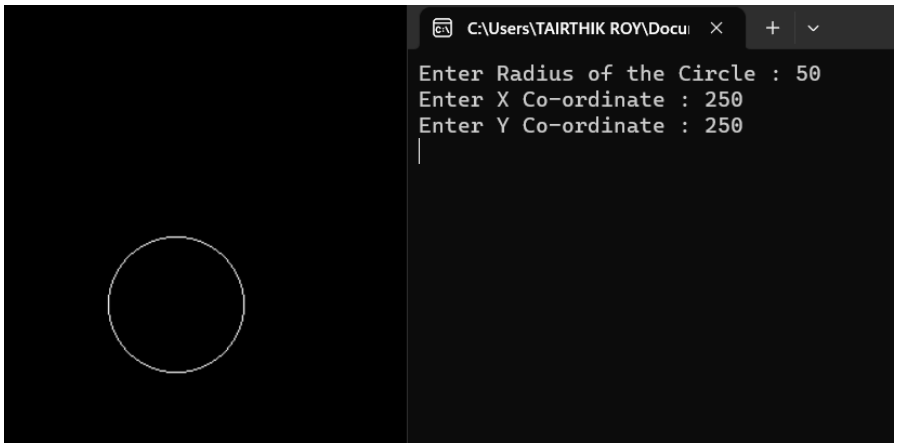
```
    scanf("%d%d", &x0, &y0);
    printf("Enter co-ordinates of second point: ");
    scanf("%d%d", &x1, &y1);
    drawline(x0, y0, x1, y1);
    return 0;
}
```

2. Write a program to implement mid-point circle drawing algorithm.

```
#include <iostream>
#include <graphics.h>

using namespace std;
int xCentre;
int yCentre;
void drawPoint(int x, int y)
{
    putpixel(x + xCentre, y + yCentre, WHITE);
    putpixel(y + yCentre, x + xCentre, WHITE);
    putpixel(-x + xCentre, y + yCentre, WHITE);
    putpixel(y + yCentre, -x + xCentre, WHITE);
    putpixel(x + xCentre, -y + yCentre, WHITE);
    putpixel(-y + yCentre, x + xCentre, WHITE);
    putpixel(-x + xCentre, -y + yCentre, WHITE);
    putpixel(-y + yCentre, -x + xCentre, WHITE);
}
```

```
int main()
{
   initwindow(960, 540);
   int radius;
   cout << "Enter Radius of the Circle : ";
   cin >> radius;
   cout << "Enter X Co-ordinate : ";
   cin >> xCentre;
   cout << "Enter Y Co-ordinate : ";
   cin >> yCentre;
   float d = float(5 / 4) - radius;
   int x = 0;
   int y = radius;
   drawPoint(x, y);
   while (y > x)
   {
      if (d < 0)
      {
         d = d + 2 * x + 3;
         x++;
      }
      else
      {
         d = d + 2 * x - 2 * y + 5;
         x++;
         y--;
      }
      drawPoint(x, y);
   }
   getch();
   closegraph();
```

```
    return 0;
}
```



3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.

```
#include <bits/stdc++.h>
#include <graphics.h>
using namespace std;
int xmin, xmax, ymin, ymax;
struct lines {
    int x1, y1, x2, y2;
};
int sign(int x)
{
    if (x > 0)
        return 1;
    else
        return 0;
}
void clip(struct lines mylines)
{
    int bits[4], byte[4], i, var;
    setcolor(RED);
    bits[0] = sign(xmin - mylines.x1);
    byte[0] = sign(xmin - mylines.x2);
```

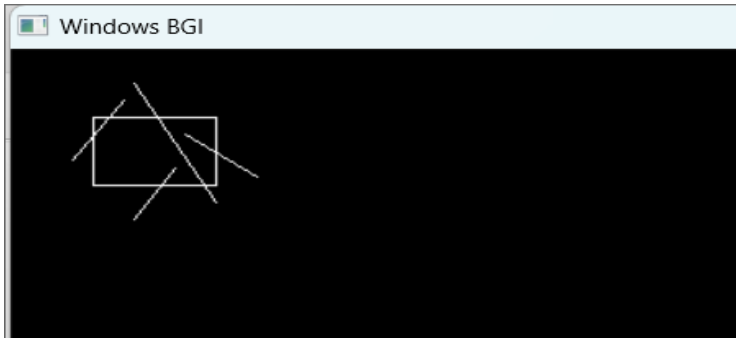
```
bits[1] = sign(mylines.x1 - xmax);
byte[1] = sign(mylines.x2 - xmax);
bits[2] = sign(ymin - mylines.y1);
byte[2] = sign(ymin - mylines.y2);
bits[3] = sign(mylines.y1 - ymax);
byte[3] = sign(mylines.y2 - ymax);
string initial = "", end = "", temp = "";
for (i = 0; i < 4; i++) {
   if (bits[i] == 0)
      initial += '0';
   else
      initial += '1';
}
for (i = 0; i < 4; i++) {
   if (byte[i] == 0)
      end += '0';
   else
      end += '1';
}
float m = (mylines.y2 - mylines.y1) / (float)(mylines.x2 - mylines.x1);
float c = mylines.y1 - m * mylines.x1;
if (initial == end && end == "0000") {
   line(mylines.x1, mylines.y1, mylines.x2, mylines.y2);
   return;
}
else {
   for (i = 0; i < 4; i++) {
      int val = (bits[i] & byte[i]);
      if (val == 0)
         temp += '0';
      else
```

```
        temp += '1';
    }
    if (temp != "0000")
        return;
    for (i = 0; i < 4; i++) {
        if (bits[i] == byte[i])
            continue;
        if (i == 0 && bits[i] == 1) {
            var = round(m * xmin + c);
            mylines.y1 = var;
            mylines.x1 = xmin;
        }
        if (i == 0 && byte[i] == 1) {
            var = round(m * xmin + c);
            mylines.y2 = var;
            mylines.x2 = xmin;
        }
        if (i == 1 && bits[i] == 1) {
            var = round(m * xmax + c);
            mylines.y1 = var;
            mylines.x1 = xmax;
        }
        if (i == 1 && byte[i] == 1) {
            var = round(m * xmax + c);
            mylines.y2 = var;
            mylines.x2 = xmax;
        }
        if (i == 2 && bits[i] == 1) {
            var = round((float)(ymin - c) / m);
            mylines.y1 = ymin;
            mylines.x1 = var;
```

```
    }
    if (i == 2 && byte[i] == 1) {
        var = round((float)(ymin - c) / m);
        mylines.y2 = ymin;
        mylines.x2 = var;
    }
    if (i == 3 && bits[i] == 1) {
        var = round((float)(ymax - c) / m);
        mylines.y1 = ymax;
        mylines.x1 = var;
    }
    if (i == 3 && byte[i] == 1) {
        var = round((float)(ymax - c) / m);
        mylines.y2 = ymax;
        mylines.x2 = var;
    }
    bits[0] = sign(xmin - mylines.x1);
    byte[0] = sign(xmin - mylines.x2);
    bits[1] = sign(mylines.x1 - xmax);
    byte[1] = sign(mylines.x2 - xmax);
    bits[2] = sign(ymin - mylines.y1);
    byte[2] = sign(ymin - mylines.y2);
    bits[3] = sign(mylines.y1 - ymax);
    byte[3] = sign(mylines.y2 - ymax);
}
initial = "", end = "";
for (i = 0; i < 4; i++) {
    if (bits[i] == 0)
        initial += '0';
    else
        initial += '1';
```

```
        }
        for (i = 0; i < 4; i++) {
            if (byte[i] == 0)
                end += '0';
            else
                end += '1';
        }
        if (initial == end && end == "0000") {
            line(mylines.x1, mylines.y1, mylines.x2, mylines.y2);
            return;
        }
        else
            return;
    }
}
int main()
{
    int gd = DETECT, gm;
    xmin = 40;
    xmax = 100;
    ymin = 40;
    ymax = 80;
    initgraph(&gd, &gm, NULL);
    line(xmin, ymin, xmax, ymin);
    line(xmax, ymin, xmax, ymax);
    line(xmax, ymax, xmin, ymax);
    line(xmin, ymax, xmin, ymin);
    struct lines mylines[4];
    mylines[0].x1 = 30;
    mylines[0].y1 = 65;
    mylines[0].x2 = 55;
```

```
    mylines[0].y2 = 30;
    mylines[1].x1 = 60;
    mylines[1].y1 = 20;
    mylines[1].x2 = 100;
    mylines[1].y2 = 90;
    mylines[2].x1 = 60;
    mylines[2].y1 = 100;
    mylines[2].x2 = 80;
    mylines[2].y2 = 70;
    mylines[3].x1 = 85;
    mylines[3].y1 = 50;
    mylines[3].x2 = 120;
    mylines[3].y2 = 75;
    for (int i = 0; i < 4; i++) {
       line(mylines[i].x1, mylines[i].y1,
            mylines[i].x2, mylines[i].y2);
       delay(1000);
    }
    for (int i = 0; i < 4; i++) {
       clip(mylines[i]);
       delay(1000);
    }
    delay(4000);
    getch();
    closegraph();
    return 0;
}
```



4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.

```
#include<iostream>
using namespace std;
#include<conio.h>
#include<graphics.h>
#define round(a) ((int)(a+0.5))
int k;
float xmin,ymin,xmax,ymax,arr[20],m;
void clipl(float x1,float y1,float x2,float y2)
{
   if(x2-x1)
      m=(y2-y1)/(x2-x1);
   else
      m=100000;
   if(x1 >= xmin && x2 >= xmin)
   {
      arr[k]=x2;
      arr[k+1]=y2;
      k+=2;
```

```
    }
    if(x1 < xmin && x2 >= xmin)
    {
        arr[k]=xmin;
        arr[k+1]=y1+m*(xmin-x1);
        arr[k+2]=x2;
        arr[k+3]=y2;
        k+=4;
    }
    if(x1 >= xmin  && x2 < xmin)
    {
        arr[k]=xmin;
        arr[k+1]=y1+m*(xmin-x1);
        k+=2;
    }
}

void clipt(float x1,float y1,float x2,float y2)
{
    if(y2-y1)
        m=(x2-x1)/(y2-y1);
    else
        m=100000;
    if(y1 <= ymax && y2 <= ymax)
    {
        arr[k]=x2;
        arr[k+1]=y2;
        k+=2;
    }
    if(y1 > ymax && y2 <= ymax)
    {
```

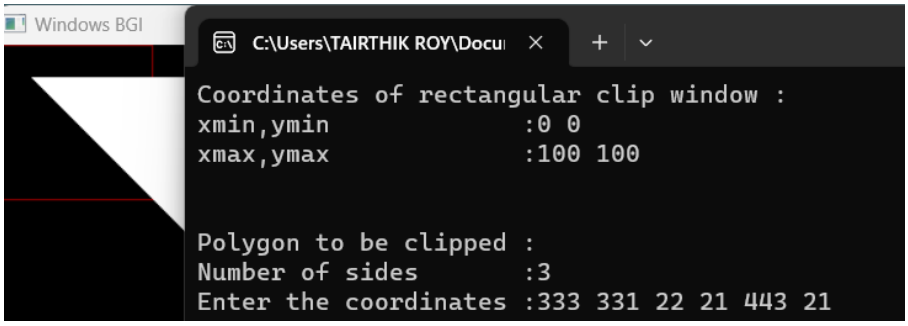
```
        arr[k]=x1+m*(ymax-y1);
        arr[k+1]=ymax;
        arr[k+2]=x2;
        arr[k+3]=y2;
        k+=4;
    }
    if(y1 <= ymax  && y2 > ymax)
    {
        arr[k]=x1+m*(ymax-y1);
        arr[k+1]=ymax;
        k+=2;
    }
}

void clipr(float x1,float y1,float x2,float y2)
{
    if(x2-x1)
        m=(y2-y1)/(x2-x1);
    else
        m=100000;
    if(x1 <= xmax && x2 <= xmax)
    {
        arr[k]=x2;
        arr[k+1]=y2;
        k+=2;
    }
    if(x1 > xmax && x2 <= xmax)
    {
        arr[k]=xmax;
        arr[k+1]=y1+m*(xmax-x1);
        arr[k+2]=x2;
```

```
        arr[k+3]=y2;
        k+=4;
    }
    if(x1 <= xmax  && x2 > xmax)
    {
        arr[k]=xmax;
        arr[k+1]=y1+m*(xmax-x1);
        k+=2;
    }
}

void clipb(float x1,float y1,float x2,float y2)
{
    if(y2-y1)
        m=(x2-x1)/(y2-y1);
    else
        m=100000;
    if(y1 >= ymin && y2 >= ymin)
    {
        arr[k]=x2;
        arr[k+1]=y2;
        k+=2;
    }
    if(y1 < ymin && y2 >= ymin)
    {
        arr[k]=x1+m*(ymin-y1);
        arr[k+1]=ymin;
        arr[k+2]=x2;
        arr[k+3]=y2;
        k+=4;
    }
```

```
    if(y1 >= ymin  && y2 < ymin)
    {
       arr[k]=x1+m*(ymin-y1);
       arr[k+1]=ymin;
       k+=2;
    }
}

int main()
{
    int gdriver=DETECT,gmode,n,poly[20];
    float xi,yi,xf,yf,polyy[20];
    cout<<"Coordinates of rectangular clip window :\nxmin,ymin            :";
    cin>>xmin>>ymin;
    cout<<"xmax,ymax            :";
    cin>>xmax>>ymax;
    cout<<"\n\nPolygon to be clipped :\nNumber of sides       :";
    cin>>n;
    cout<<"Enter the coordinates :";
    int i = 0;
    for(i=0;i < 2*n;i++)
       cin>>polyy[i];
    polyy[i]=polyy[0];
    polyy[i+1]=polyy[1];
    for(i=0;i < 2*n+2;i++)
       poly[i]=round(polyy[i]);
    initgraph(&gdriver,&gmode,NULL);
    setcolor(RED);
    rectangle(xmin,ymax,xmax,ymin);
    cout<<"\t\tPolygon unclipped";
    setcolor(WHITE);
```

```
fillpoly(n,poly);
getch();
cleardevice();
k=0;
for(i=0;i < 2*n;i+=2)
   clipl(polyy[i],polyy[i+1],polyy[i+2],polyy[i+3]);
n=k/2;
for(i=0;i < k;i++)
   polyy[i]=arr[i];
polyy[i]=polyy[0];
polyy[i+1]=polyy[1];
k=0;
for(i=0;i < 2*n;i+=2)
   clipt(polyy[i],polyy[i+1],polyy[i+2],polyy[i+3]);
n=k/2;
for(i=0;i < k;i++)
   polyy[i]=arr[i];
polyy[i]=polyy[0];
polyy[i+1]=polyy[1];
k=0;
for(i=0;i < 2*n;i+=2)
   clipr(polyy[i],polyy[i+1],polyy[i+2],polyy[i+3]);
n=k/2;
for(i=0;i < k;i++)
   polyy[i]=arr[i];
polyy[i]=polyy[0];
polyy[i+1]=polyy[1];
k=0;
for(i=0;i < 2*n;i+=2)
   clipb(polyy[i],polyy[i+1],polyy[i+2],polyy[i+3]);
for(i=0;i < k;i++)
```

```
        poly[i]=round(arr[i]);
    if(k)
        fillpoly(k/2,poly);
    setcolor(RED);
    rectangle(xmin,ymax,xmax,ymin);
    cout<<"\tClipped polygon";
    getch();
    closegraph();
    return 0;
}
```



5. Write a program to fill a polygon using Scan line fill algorithm.

```
#include <conio.h>
#include <iostream>
#include <graphics.h>
#include <stdlib.h>
using namespace std;
class point
{
    public:
    int x,y;
};

class poly
{
        point p[20];
```

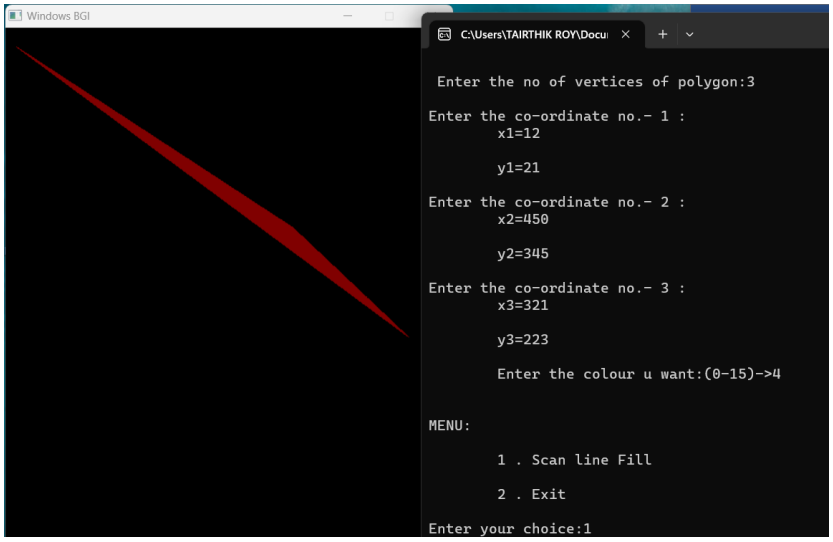
```
    int inter[20],x,y;
    int v,xmin,ymin,xmax,ymax;
  public:
    int c;
    void read();
    void calcs();
    void display();
    void ints(float);
    void sort(int);
};
void poly::read()
{
  int i;
  cout<<"\n Enter the no of vertices of polygon:";
  cin>>v;
  if(v>2)
  {
    for(i=0;i<v; i++)
    {
      cout<<"\nEnter the co-ordinate no.- "<<i+1<<" : ";
      cout<<"\n\tx"<<(i+1)<<"=";
      cin>>p[i].x;
      cout<<"\n\ty"<<(i+1)<<"=";
      cin>>p[i].y;
    }
    p[i].x=p[0].x;
    p[i].y=p[0].y;
    xmin=xmax=p[0].x;
    ymin=ymax=p[0].y;
  }
  else
```

```
        cout<<"\n Enter valid no. of vertices.";
}
void poly::calcs()
{
   for(int i=0;i<v;i++)
   {
      if(xmin>p[i].x)
      xmin=p[i].x;
      if(xmax<p[i].x)
      xmax=p[i].x;
      if(ymin>p[i].y)
      ymin=p[i].y;
      if(ymax<p[i].y)
      ymax=p[i].y;
   }
}
void poly::display()
{
   int ch1;
   char ch='y';
   float s,s2;
   do
   {
      cout<<"\n\nMENU:";
      cout<<"\n\n\t1 . Scan line Fill ";
      cout<<"\n\n\t2 . Exit ";
      cout<<"\n\nEnter your choice:";
      cin>>ch1;
      switch(ch1)
      {
         case 1:
```

```
            s=ymin+0.01;
            delay(100);
            cleardevice();
            while(s<=ymax)
            {
               ints(s);
               sort(s);
               s++;
            }
            break;
         case 2:
            exit(0);
      }

      cout<<"Do you want to continue?: ";
      cin>>ch;
   }while(ch=='y' || ch=='Y');
}

void poly::ints(float z)
{
   int x1,x2,y1,y2,temp;
   c=0;
   for(int i=0;i<v;i++)
   {
      x1=p[i].x;
      y1=p[i].y;
      x2=p[i+1].x;
      y2=p[i+1].y;
      if(y2<y1)
      {
```

```
            temp=x1;
            x1=x2;
            x2=temp;
            temp=y1;
            y1=y2;
            y2=temp;
        }
        if(z<=y2&&z>=y1)
        {
            if((y1-y2)==0)
            x=x1;
            else
            {
                x=((x2-x1)*(z-y1))/(y2-y1);
                x=x+x1;
            }
            if(x<=xmax && x>=xmin)
            inter[c++]=x;
        }
    }
}

void poly::sort(int z)
{
    int temp,j,i;

        for(i=0;i<v;i++)
        {
            line(p[i].x,p[i].y,p[i+1].x,p[i+1].y);
        }
        delay(100);
```

```
        for(i=0; i<c;i+=2)
        {
           delay(100);
           line(inter[i],z,inter[i+1],z);
        }
}
int main()
   {
   int cl;
   initwindow(500,600);
   cleardevice();
   poly x;
   x.read();
   x.calcs();
   cleardevice();
   cout<<"\n\tEnter the colour u want:(0-15)->";
   cin>>cl;
   setcolor(cl);
   x.display();
   closegraph();
   getch();
   return 0;
}
```

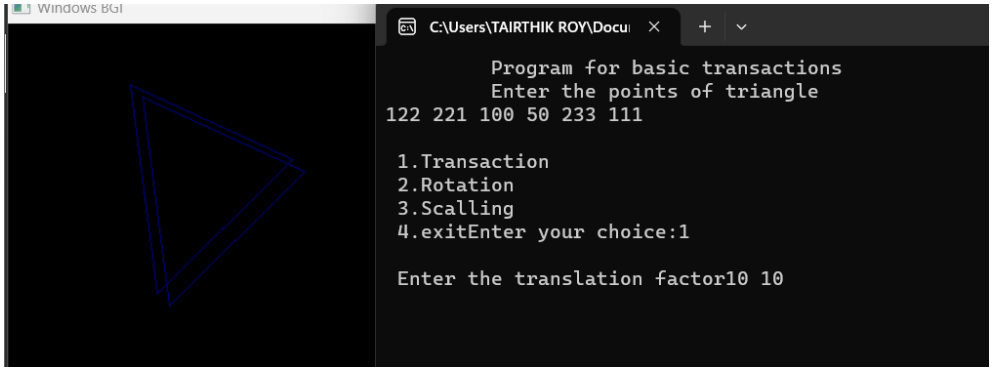


6. Write a program to apply various 2D transformations on a 2D object (use homogenous 64 Coordinates).

```
#include <graphics.h>
#include <stdlib.h>
#include <stdio.h>
#include <conio.h>
#include<math.h>
void main()
{
   int gm;
   int gd=DETECT;
   int x1,x2,x3,y1,y2,y3,nx1,nx2,nx3,ny1,ny2,ny3,c;
   int sx,sy,xt,yt,r;
   float t;
   initgraph(&gd,&gm,"c:\tc\bg:");
   printf("\t Program for basic transactions");
   printf("\n\t Enter the points of triangle");
   setcolor(1);
   scanf("%d%d%d%d%d%d",&x1,&y1,&x2,&y2,&x3,&y3);
   line(x1,y1,x2,y2)
   line(x2,y2,x3,y3);
```

```
line(x3,y3,x1,y1);
getch();
printf("\n 1.Transaction\n 2.Rotation\n 3.Scalling\n 4.exit");
printf("Enter your choice:");
scanf("%d",&c);
   switch(c)
   {
      case 1:
         printf("\n Enter the translation factor");
         scanf("%d%d",&xt,&yt);
         nx1=x1+xt;
         ny1=y1+yt;
         nx2=x2+xt;
         ny2=y2+yt;
         nx3=x3+
         ny3=y3+yt;
         line(nx1,ny1,nx2,ny2);
         line(nx2,ny2,nx3,ny3);
         line(nx3,ny3,nx1,ny1);
         getch();
      case 2:
         printf("\n Enter the angle of rotation");
         scanf("%d",&r);
         t=3.14*r/180;
         nx1=abs(x1*cos(t)-y1*sin(t));
         ny1=abs(x1*sin(t)+y1*cos(t));
         nx2=abs(x2*cos(t)-y2*sin(t));
         ny2=abs(x2*sin(t)+y2*cos(t));
         nx3=abs(x3*cos(t)-y3*sin(t));
         ny3=abs(x3*sin(t)+y3*cos(t));
         line(nx1,ny1,nx2,ny2);
```

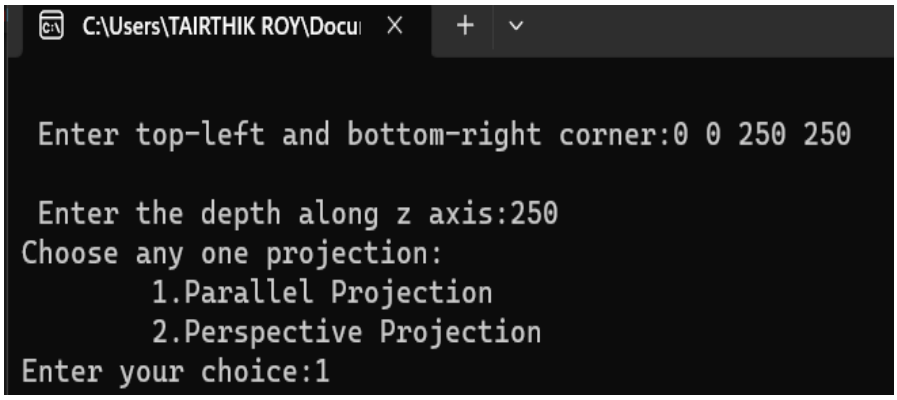
```
            line(nx2,ny2,nx3,ny3);
            line(nx3,ny3,nx1,ny1);
            getch();
        case 3:
            printf("\n Enter the scalling factor");
            scanf("%d%d",&sx,&sy);
            nx1=x1*sx;
            ny1=y2*sy;
            nx2=x2*sx;
            ny2=y2*sy;
            nx3=x3*sx;
            ny3=y3*sy;
            line(nx1,ny1,nx2,ny2);
            line(nx2,ny2,nx3,ny3);
            line(nx3,ny3,nx1,ny1);
            getch();

        case 4:
            break;
        default:
            printf("Enter the correct choice");
      }
   closegraph();
}
```



7. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.

```
#include<graphics.h>
#include<iostream>
#include<conio.h>
using namespace std;
int gd,gm,x1,y1,x2,y2,dep,ch;
int main()
{
cout<<"\n Enter top-left and bottom-right corner:";
cin>>x1>>y1>>x2>>y2;
cout<<"\n Enter the depth along z axis:";
cin>>dep;
do
{
cout<<"Choose any one projection:\n\t1.Parallel Projection\n\t2.Perspective Projection\nEnter your choice:";
cin>>ch;
initgraph(&gd,&gm,NULL);
switch(ch)
{
case 1:
rectangle(x2+100,y1,x2+100+dep,y2);
outtextxy(x2+100,y1-10,NULL);
rectangle(x1,y1,x2,y2);
outtextxy(x1,y1-10,NULL);
rectangle(x1,y1-(y2-y1),x2,x1+dep-(y2-y1));
outtextxy(x1,y1-(y2-y1)-10,NULL);
getch();
closegraph();
break;
case 2:
```

```
bar3d(x1,y1,x2,y2,dep,1);
getch();
closegraph();
break;
}
}while(ch<3);
return 0;
}
```



8. Write a program to draw Hermite /Bezier curve.

```
#include <stdio.h>
#include <graphics.h>
#include <math.h>

int x[4]={200,100,200,250};
int y[4]={200,150,75,100};
```

```
void bezier ()
{
int i;
double t,xt,yt;
for (t = 0.0; t < 1.0; t += 0.0005)
{
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];
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,WHITE);
}

for (i=0; i<4; i++)
 putpixel (x[i], y[i], YELLOW);
getch();
closegraph();
}
int main()
{
int gd = DETECT, gm;
initgraph (&gd, &gm, NULL);
bezier ();
return 0;
}
```