UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2011/2012

COURSE NAME	:	GRAPHIC PROGRAMMING
COURSE CODE	:	BIT 2023 / BIT 20203
PROGRAMME	:	BACHELOR OF INFORMATION TECHNOLOGY
EXAMINATION DATE	:	JANUARY 2012
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTION.

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

PART A

Instruction: Answer **ALL** questions.

Q1 Fill in the blank to complete the statement.

(a) LCD is an example of a _____ display.

(b) An _____ surface can be described as an extension of a spherical surface, where the radius in 3 mutually perpendicular directions can have different values.

(c) Scaling transformation with the scale parameter of 0.5 will make the transformed object _____.

(d) For Midpoint circle's algorithm, the next pixel position is (x_k+1, y_k+1) if the decision parameter is _____.

(e) Parts of objects that are intended to appear farther from the viewer are displayed at _____ intensity.

(10 marks)

PART B

Instruction: Answer **ALL** questions.

Q2 Describe the function for each OpenGL statement below.

(a)
```
glClearColor(1.0,1.0,1.0,1.0);
```
(2 marks)

(b)
```
glEnd( );
```
(2 marks)

(c)
```
glRotatef(1.0,1.0,0.0,0.0)
```
(2 marks)

(d)
```
glTranslatef(4.0,0.0,0.0);
```
(2 marks)

Q3 (a) Show with a sketch, the result after the concave polygon in **Figure Q3 (a)** being clipped using Weiler-Atherton algorithm.

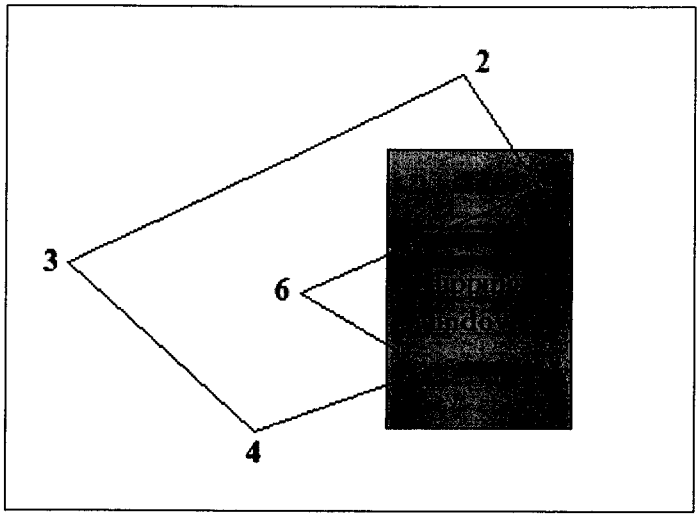

Figure Q3 (a)

(5 marks)

(b) Write a code segment using the `GL_LINE_LOOP` function to create a triangle as shown in **Figure Q3 (b)**.

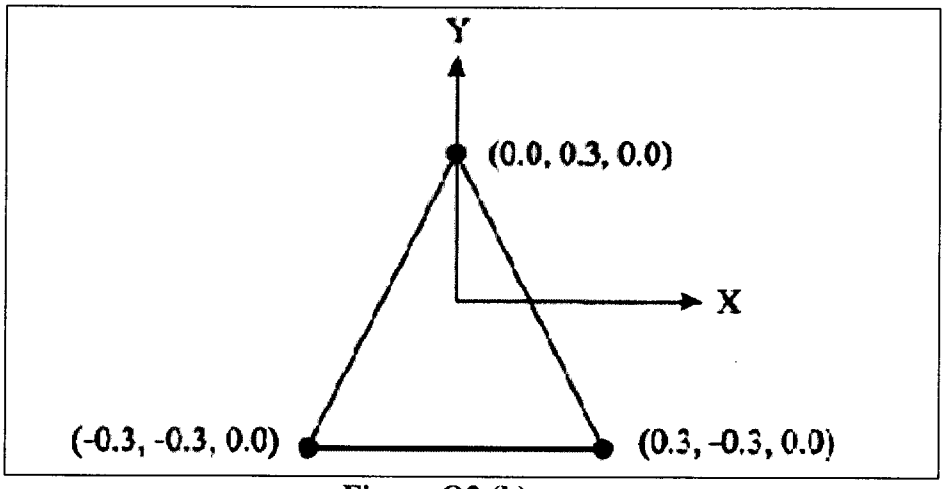

Figure Q3 (b)

(10 marks)

(c) Fill in the blank with the missing commands/parameters in the program.

(10 marks)

```
void _____________(void)
{
        glClear (GL_COLOR_BUFFER_BIT);
        glColor3f(____,____,_____); //fill blue color
        glPointSize(40.0);
        glBegin(GL_POINTS);
        glVertex2f(80.0f,150.0f);
        glEnd();
        glFlush();
}
int main (int argc, char **argv)
{
        glutInit(&argc,_______);
        glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
        glutInitWindowPosition (350,50);
        glutInitWindowSize(400,300);
        _________________ (" My Blue Dot ");
        init();
        glutDisplayFunc(_____________);
        glutMainLoop();
        return 0;
}
```

Q4 (a) You are given two endpoints `P1 = (-15,-9)` and `P2 = (-10,-5)`. Using Bresenham's line algorithm, calculate each pixel coordinate along the line segment `P1` to `P2`. Please provide your workflow to derive the answer.

(15 marks)

Decision parameters:

$P_0 = 2\Delta y - \Delta x$

$P_{k+1} = P_k + 2\Delta y - 2x\Delta$

$P_{k+1} = P_k + 2\Delta y$

Sample workflow:

k	P_k	(x_{k+1}, y_{k+1})

The pixel coordinates starting from `P1` to `P2` are:

(b) Given the following code segment:

```
void drawing()
{
        glBegin(GL_QUADS);
        glColor3f(1.0, 0.0, 0.0);
        glVertex3f(-0.5, -0.5, 0.5);
        glVertex3f( 0.5, -0.5, 0.5);
        glVertex3f( 0.5, 0.5, 0.5);
        glVertex3f(-0.5, 0.5, 0.5);
        glVertex3f(-0.5, -0.5, -0.5);
        glVertex3f(-0.5, 0.5, -0.5);
        glVertex3f( 0.5, 0.5, -0.5);
        glVertex3f( 0.5, -0.5, -0.5);

        glColor3f(0.0, 1.0, 0.0);
        glVertex3f(-0.5, -0.5, 0.5);
        glVertex3f(-0.5, 0.5, 0.5);
        glVertex3f(-0.5, 0.5, -0.5);
        glVertex3f(-0.5, -0.5, -0.5);
        glVertex3f( 0.5, -0.5, -0.5);
        glVertex3f( 0.5, 0.5, -0.5);
        glVertex3f( 0.5, 0.5, 0.5);
        glVertex3f( 0.5, -0.5, 0.5);

        glColor3f(0.0, 0.0, 1.0);
        glVertex3f(-0.5, 0.5, 0.5);
        glVertex3f( 0.5, 0.5, 0.5);
        glVertex3f( 0.5, 0.5, -0.5);
        glVertex3f(-0.5, 0.5, -0.5);
        glVertex3f(-0.5, -0.5, 0.5);
        glVertex3f(-0.5, -0.5, -0.5);
        glVertex3f( 0.5, -0.5, -0.5);
        glVertex3f( 0.5, -0.5, 0.5);
        glEnd();
}
```

Sketch the output of the code segment (including the color information) above.

(12 marks)

PART C

Instruction: Answer **ALL** questions.

Q5 Given the original point of a square is P1 (2,4), P2 (4,4), P3 (4,2) and P4 (2,2).

(a) Scale the object using $s_x = s_y = 2$ about a fixed point $(x_f, y_f) = (3,3)$ and give the new points after the transformation.

(10 marks)

(b) Then, shear the scaled object using $sh_y = 3/2$ and $x_{ref} = -1$ in the y direction and give the new points after the transformation.

(5 marks)

Q6 Given input $r_y = 8$, $r_x = 6$ and ellipse center $(-5,6)$. Assume your objective is to find the pixels for the whole ellipse. Write a step by step algorithm to achieve the objective.

(15 marks)