Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	GRAPHICS PROGRAMMING
COURSE CODE	:	BIT 20203
PROGRAMME	:	BIT
EXAMINATION DATE	:	JANUARY / FEBUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. THE FINAL EXAMINATION IS CONDUCTED ONLINE AND CLOSE BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 Explains **THREE (3)** advantages using graphics in presentations and reports.

(6 marks)

Q2 Consider a straight line segment with endpoints of `(1,2)` and `(8,8)`.

(a) Find the slope, `m` for the endpoints.

(2 marks)

(b) Calculate each pixel coordinates along the line segment using Digital Differential Analyzer (DDA) algorithm. Show your calculations from `right to left`.

Decision parameters for |m| < 1:

$y_{k+1} = y_k + m$ or $y_{k+1} = y_k - m$

(9 marks)

(c) Plot the generated line pixels in grid form based on the answer in **Q2(b)**.

(2 marks)

Q3 Using the Midpoint Circle algorithm and decision parameters given in **Figure Q3**, determine the positions along the circle octant in the 1st quadrant. Given, a circle center `(-1, 2)` and radius, `r = 7`. Show your calculation.

$p_0 = 1 - r$
$p_{k+1} = p_k + 2x_{k+1} + 1$ $p_{k+1} = p_k + 2x_{k+1} + 1 - 2y_{k+1}$

FIGURE Q3

(12 marks)

Q4 Suppose a 2-dimensional clipping window has its lower left corner at A(20, 20) and its upper right corner at C(100, 90). There are 2 lines P_1P_2 with P_1(30,10), P_2(55,60) and P_2P_3 with P_3(30,100) in the window. By using Cohen-Sutherland line clipping algorithm,

(a) find the region codes for the endpoints P_1, P_2 and P_3.

(6 marks)

(b) calculate the new endpoints of lines that intersect with the clipping window.

(8 marks)

(c) draw the output that will be displayed in the window.

(2 marks)

Q5 (a) Explain what is meant by scaling less than 1, scaling equal zeros and scaling greater than 1.

(4 marks)

(b) List **TWO (2)** parameters that must be identified before a rotation transformation can be performed.

(2 marks)

Q6 Given below is an OpenGL code to generate a square.

```
glBegin(GL_QUADS);
   glVertex2i(10,10);
   glVertex2i(100,10);
   glVertex2i(100,100);
   glVertex2i(10,100);
glEnd();
```

(a) By using the homogeneous coordinate, write the individual transformation matrices to implement the following transformation

```
glRotatef(90.0f, 0.0f, 1.0f);
glScalef(0.5, 0.5, 1.0f);
glTranslatef(100.0f, 0.0f, 0.0f);
```

(3 marks)

(b) Calculate the new position of the square if it were subjected to transformations in **Q6(a)**.

(6 marks)

(c) Sketch an output display of the square at it's initial position and after performing the transformation.

(4 marks)

Q7 (a) Based on **Figure Q7** identify any **THREE (3)** properties of a 3D object that can be used to transform the image into a 3D object.

(6 marks)

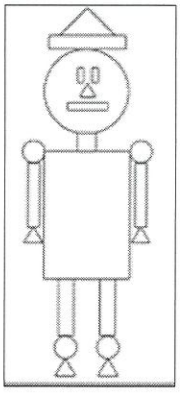

FIGURE Q7

(b) Based on your anwsers in **Q7(a)**, describe how the properties can be used to tranform the 2D image into a 3D object.

(6 marks)

(c) Suggest a projection type to display the 3D object and justify your selection.

(2 marks)

- END OF QUESTIONS -