Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	GRAPHICS PROGRAMMING
COURSE CODE	:	BIT 20203
PROGRAMME	:	BIT
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

Q1 (a) List **THREE (3)** types of clipping.

(3 marks)

(b) Let ABCD be a rectangle window with `A(20,20)`, `B(90,20)`, `C(90,70)`, `D(20,70)` and line `P1P2` with `P1(30,80)` and `P2(100,30)`. By using Cohen-Sutherland line clipping algorithm,

(i) find the region codes for the endpoints `P1` and `P2`.

(4 marks)

(ii) calculate the new endpoints `P1'` and `P2'`.

(10 marks)

Q2 Consider the transformation necessary to scale a 2-dimensional object centered at `(-1,3)` by 4 in the *y*-direction. The resulting object is still to be centered at `(-1,3)`.

(a) List the sequence of steps necessary to accomplish this transformation.

(3 marks)

(b) Write the individual transformation matrices needed to implement each of the steps in **Q2(a)**. Use homogeneous coordinates.

(6 marks)

(c) Compute the composite transformation matrix which will accomplish the entire transformation.

(6 marks)

Q3 (a) Determine the positions along the circle octant in the **1st quadrant** using the Midpoint Circle algorithm. Given a circle center `(1,-5)` and radius, `r = 7`. (Show your calculation).

Decision parameters:

$$P_0 = 1 - r$$
$$p_{k+1} = p_k + 2x_{k+1} + 1$$
$$p_{k+1} = p_k + 2x_{k+1} + 1 - 2y_{k+1}$$

(17 marks)

(b) Plot the complete circle generated from the initial calculation in **Q3(a)**.

(6 marks)

Q4 (a) Discuss the term 'view volume'.

(5 marks)

(b) State the difference between illumination and shading.

(4 marks)

Q5 Rotation transformation are not commutative. Supposed two composite transformation matrices were applied to the point `(1,1,1)`. By using the given formulas for rotation about x and rotation about y as below, demostrate that rotations are not commutative by:

$$R_x(\theta) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos(\theta) & -\sin(\theta) & 0 \\ 0 & \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$R_y(\theta) = \begin{bmatrix} \cos(\theta) & 0 & \sin(\theta) & 0 \\ 0 & 1 & 0 & 0 \\ -\sin(\theta) & 0 & \cos(\theta) & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

(a) computing the transformation matrix for a rotation by 90° about x followed by a rotation by 90° about y.

(6 marks)

(b) computing the transformation matrix for a rotation by 90° about y followed by a rotation by 90° about x.

(6 marks)

(c) applying the two composite transformation matrices to the point `(1,1,1)`.

(4 marks)

- END OF QUESTION -