UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2020/2021

COURSE NAME	:	GRAPHICS PROGRAMMING
COURSE CODE	:	BIT 20203
PROGRAMME CODE	:	BIT
EXAMINATION DATE	:	JANUARY/ FEBRUARY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS. 2. PLEASE MAKE SURE TO CLICK "SAVE ANSWER" BUTTON FOR SUBJECTIVE QUESTIONS. OBJECTIVE QUESTIONS ARE SAVED AUTOMATICALLY.

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 For **Q1 (a) – Q1 (j)**, answer **True** or **False**.

(a) The Cohen Sutherland algorithm divides the region into 9 number of spaces.

(b) If both codes are 0000, (bitwise OR of the codes yields 0000) line lies completely outside the window.

(c) Vector co-ordinates is one of the co-ordinates used in 2d viewing transformation.

(d) Depth of field is required to give realism to object, where it gives clues to weight and solidness through shading and shadows.

(e) Homogeneous coordinates and matrix representation are used to treat all 3 transformations in a consistent way

(f) The process of mapping a world window in World Coordinates to the Viewport is called Viewing transformation.

(g) Objects appear "fuzzy" if they are close and "focus" if they are far away.

(h) To make images appear "real," programmers provide a combination of colour and texture that hopefully allow their imitation to mimic real life.

(i) Reversing the order in which a sequence of transformations is performed may affect the transformed position of an object.

(j) Colour of specular reflection depends on materials and how it scatters light.

(10 marks)

Q2 **Figure Q2** shows three 3x3 homogenized transformation matrices. Explain what would each of the matrices do when applied to an object. Prove your answer with calculation.

(9 marks)

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(a) (b) (c)

FIGURE Q2

Q3 (a) **Figure Q3** shows a one unit cube. Write out a series of 4x4 matrices that would scale the cube by 2x along the X axis and by 3x along the Y and Z axes, with the point (0,3,4) staying fixed in space.

(6 marks)

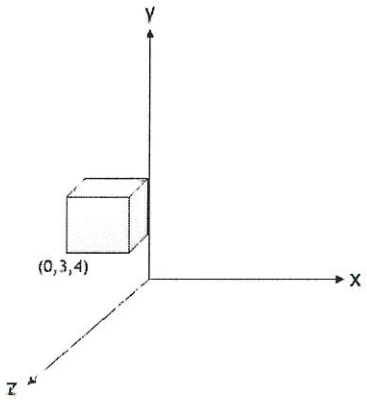


FIGURE Q3

(b) Draw the cube after the transformation in **Q3 (a)** has been completed.

(14 marks)

Q4 Suppose a 2-dimensional clipping window has its lower left corner at A(30, 50) and its upper right corner at C(220, 240). There are 2 lines P_1P_2 with P_1(10,270) P_2(300,0) and P_3P_4 with P_3(20,10) P_4(20,200) in the window. By using Cohen-Sutherland line clipping algorithm,

(a) find the region codes for the endpoints P_1, P_2, P_3 and P_4.

(8 marks)

(b) determine the endpoints of the clipped segment.

(10 marks)

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

(4 marks)

Q5 **Figure Q5** illustrates a tringular prism. Describe the surfaces that make up the faces of this polygon.

(5 marks)

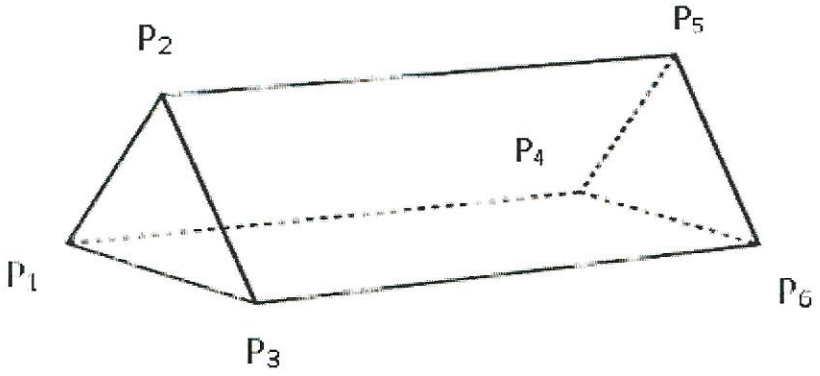


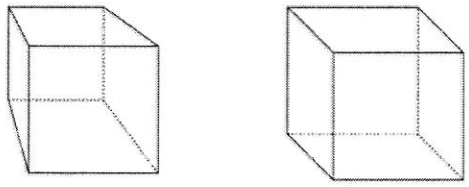
FIGURE Q5

Q6 (a) Discuss any **TWO** differences between parallel and perspective projections. Describe an application where each type of projection would be preferable.

(8 marks)

(b) **Figure Q6 (a)** and **(b)** shows a cube under two different projections. Label the projections accordingly.

(4 marks)



(a) **(b)**

FIGURE Q6

Q7 (a) Label each of the letters **R, S & T** in **Figure Q7** with the appropriate vector related to lighting.

(6 marks)

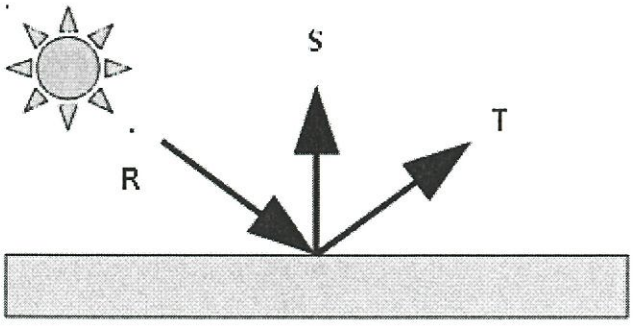


FIGURE Q7

(b) Distinguish between the descriptions listed below by writing a "**D**" next to each item that is a property of diffuse reflection, an "**S**" next to each item that is a property of specular reflection, and a "**B**" next to each that is a property of both

(i) used to simulate highlights
(ii) shading color depends only on light color
(iii) simulates scattering of light

(6 marks)

- END OF QUESTION –