UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	VIRTUAL REALITY
COURSE CODE	:	BIT 3253/BIT 32503
PROGRAMME	:	3 BIT
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1   Explain each of the following statement:

(a)   Standard cartesian frame of reference is required to achieve two perspective views for positioning virtual object.

(2 marks)

(b)   Initial orientation of virtual observer (VO) within the virtual environment (VE) while rotating virtual object.

(2 marks)

(c)   The implication of inverse operation when the coordinate transformation relating to the vertices in the VE relative to the VO.

(2 marks)

(d)   The implication of new frame of reference if the VO is offset by t_x, t_y, t_z .

(2 marks)

(e)   The implication when objects offset from the origin is scaled.

(2 marks)

Q2   (a)   State the consequence if the virtual observer (VO) and actual world (W) are aligned. Illustrate the situation and write the matrix transformation.

(6 marks)

(b)   Based on **FIGURE Q2** below, what is the coordinate of P' if the VO is offset by $(t_x, t_y, t_z) = (2,1,2)$ and P(1,0,1) is given? Sketch the new orientation of VO and P'. Show your working.
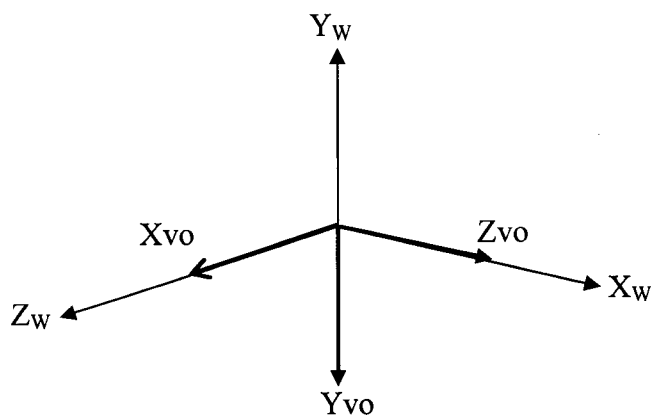
(9 marks)

FIGURE Q2

Q3 The perspective view of standard computer graphic is established by locating the VO's frame of reference within the virtual world.

(a) Sketch a new orientation of VO after subjecting its rotation to a roll of 90^0, a pitch of -90^0 and a yaw of -180^0 followed by a translation of (3,2,0) using XYZ Fixed angles method. Show your working.

(9 marks)

(b) Calculate the coordinate of P' if the point P(1,1,1) is given. Show your working.

(6 marks)

Q4 Analyze the following scenario:

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If a VO is oriented in a VE using XYZ Euler angles in the
sequence roll, pitch, yaw and translate with the following
values roll = -90°, pitch = 0° and yaw = 270°; (tx, ty, tz) =
(2,1,2).
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Calculate the coordinate for (x', y', z') if the coordinate (0,1,1) for (x, y, z) is given. Show your working

(15 marks)

Q5 (a) A unit pyramid is offset along the x-axis and y-axis by 1 unit and then scaled by a factor of 2. Calculate the P' of the scaled pyramid if P(1.5,1,1) of unit pyramid is given.
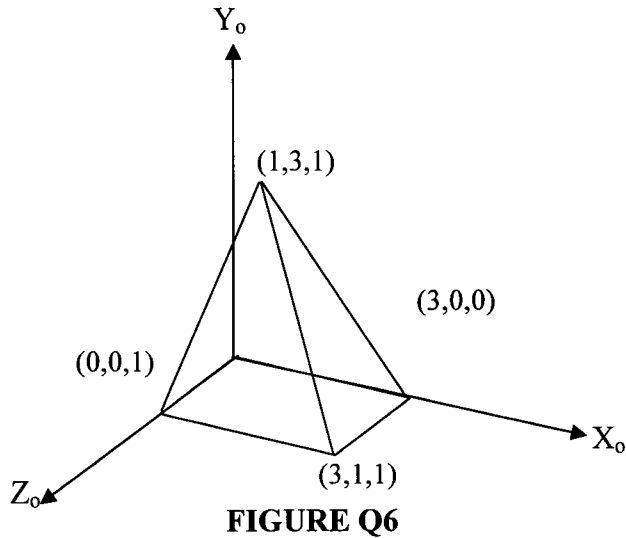
(7 marks)

(b) Draw the unit pyramid which has been scaled to the new pyramid obtained from **Q5(a)**.

(8 marks)

Q6 (a) A compound rotation can be accomplished by subjecting an object to a sequence of matrix operation. Based on **FIGURE Q6**, analyze the action of rolling the pyramid about the z-axis, after performing the 90^0 pitch rotation. Calculate and sketch the new orientation of the pyramid after accomplishing the compound rotation.

(10 marks)

FIGURE Q6

(b) **FIGURE Q6** shows the pyramid that is located at the origin of the OCS (Object Coordinate System). Using the XYZ Euler angles method, analyze the scenario below to compute the coordinates of P' in the OCS.

roll = 90° , pitch = 90° , yaw = 90°

(10 marks)

Q7 Human factors study is very important in VR that consists of series of experiments to determine the users's response to VR technology, usablility, safety as well as societal impact.

(a) Differentiate any **TWO (2)** categories of human factors studies in VR.

(5 marks)

(b) List the main stages of a VR human factors study in a correct sequence.

(5 marks)

- END OF QUESTION -