UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014

COURSE NAME   :   VIRTUAL REALITY

COURSE CODE   :   BIM 30803

PROGRAMME   :   3 BIM

EXAMINATION DATE   :   JUNE 2014

DURATION   :   3 HOURS

INSTRUCTION   :   ANSWER **ALL** QUESTIONS

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

Q1 (a) List **TWO (2)** modeling toolkit features for modeling virtual world.

(2 marks)

(b) List **TWO (2)** functions of simulation in virtual reality (VR) program.

(2 marks)

(c) Scaled-world grab is one of the interaction techniques in VR system. Identify **FOUR (4)** steps involved in this technique.

(4 marks)

(d) Distinguish the function of target-based navigation technique and route planning navigation technique.

(4 marks)

Q2 (a) State what will happen if the virtual observer (VO) and actual world (W) are aligned.

(2 marks)

(b) Illustrate the situation in **Q2(a)** and write its matrix transformation.

(5 marks)

(c) Based on **Figure Q2** below, answer the following questions.
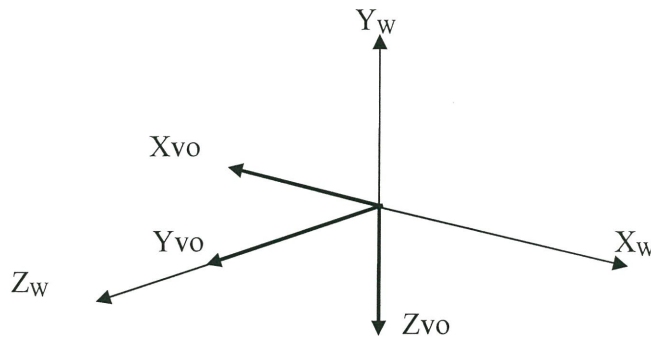
Figure Q2

(i) Calculate the coordinate of, P' if the point $P(1,1,0)$ is given. Show your working.

(2 marks)

(ii) Calculate the coordinate of P', if the VO is offset by $(t_x, t_y, t_z) = (2,2,1)$ and $P(1,0,1)$ is given. Show your working.

(5 marks)

2

Q3 (a) **Figure Q3** below is the actual orientation of both frames of reference. Based on **Figure Q3**, answer the following questions using the XYZ Fixed angles method. Show your working step by step.
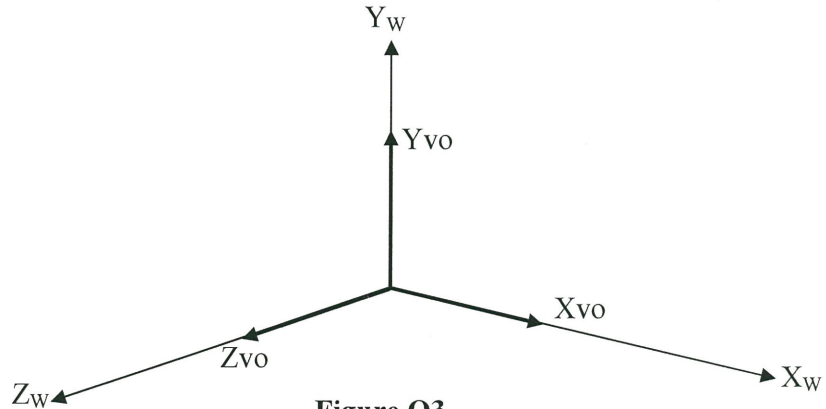
Figure Q3

(i) Draw a cube with coordinates $(1,1,1)$, $(0,0,1)$, $(1,0,0)$ and $(0,1,0)$. Calculate the new orientation of VO if the following conditions are given.

```
roll = 90° , pitch = 180° , yaw = 90°
(tx, ty, tz) = (1,3,1)
```

(7 marks)

(ii) Sketch the new orientation obtained from **Q3(a)(i).**

(3 marks)

(b) Analyze the following scenario.

```
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 = 270°, pitch = 90° and yaw = -180°; (tx, ty, tz) =
(1,2,2).
```

Calculate the coordinate for (x', y', z') if the coordinate $(1,1,1)$ for (x, y, z) is given. Show your working.

(5 marks)

(c) In developing VR environment, perspective projection procedure is valid only for objects within the observer's field of view. Therefore, object which is behind, above, below, to the left or to the right of the observer will be discarded. Propose a technique which is able to overcome the abovementioned problem.
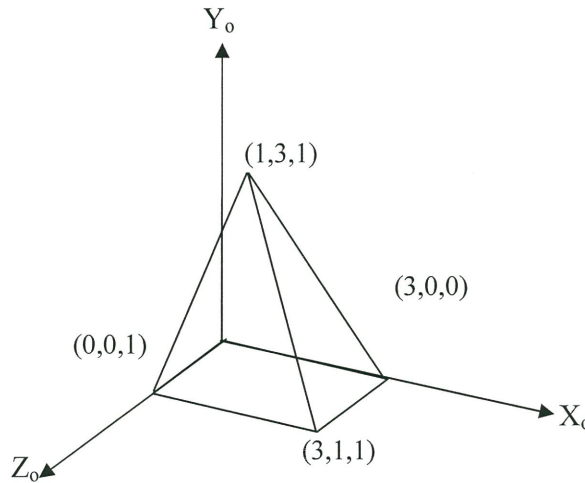
(5 marks)

Q4 (a) List **TWO (2)** transformation styles in modeling transformation.

(2 marks)

(b)   A unit cube is offset along the x-axis by 1 unit and then scaled by a factor of 3. Calculate the P' of the scaled cube if $P(1,0,0)$ of unit cube is given.

(5 marks)

(c)   Based on **Figure Q4** below, the pyramid is rolled about the *z*-axis, after performing the 90^0 pitch rotation. Sketch the new orientation of the pyramid after accomplishing the rotation using direct cosine.

(7 marks)

Figure Q4

Q5   (a)   Manipulation, navigation and communication are the key ways of interacting with a virtual world in the medium of VR.

(i)   Define manipulation in the context of VR.

(2 marks)

(ii)   Explain any **TWO (2)** manipulation methods which can be performed within a VR experience.

(2 marks)

(iii)   Explain about Pointer-directed Selection which can be used for item selection or as a directional indicator for travel control.

(5 marks)

(b)   Identify **FIVE (5)** issues that are important to be covered in human factor study of VR.

(5 marks)

(c)   Identify **THREE (3)** social impacts that might be triggered by VR and society.

(6 marks)

- END OF QUESTION -