



THE UNIVERSITY OF
WESTERN
AUSTRALIA

DESK No.

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FAMILY NAME: _____

GIVEN NAMES: _____

SIGNATURE: _____

STUDENT NUMBER:

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SEMESTER 1, 2019 EXAMINATIONS

Physics, Mathematics & Computing

Department of Computer Science & Software
Engineering

CITS3003

Graphics and Animation

This paper contains: 3 Pages (including title page)

Time Allowed: 2:00 hours

Total marks = 70

There are a total of 7 questions each carrying 10 marks. Some questions have sub-parts. Solve all questions including their sub-parts on the provided answer sheets.

Write your names and student numbers on the question paper as well as the answer sheet and return both at the end of the exam.

THIS IS A CLOSED BOOK EXAMINATION

SUPPLIED STATIONERY

ALLOWABLE ITEMS

PLEASE NOTE

Examination candidates may only bring authorised materials into the examination room. If a supervisor finds, during the examination, that you have unauthorised material, in whatever form, in the vicinity of your desk or on your person, whether in the examination room or the toilets or en route to/from the toilets, the matter will be reported to the head of school and disciplinary action will normally be taken against you. This action may result in your being deprived of any credit for this examination or even, in some cases, for the whole unit. This will apply regardless of whether the material has been used at the time it is found.

Therefore, any candidate who has brought any unauthorised material whatsoever into the examination room should declare it to the supervisor immediately. Candidates who are uncertain whether any material is authorised should ask the supervisor for clarification.

Candidates must comply with the Examination Rules of the University and with the directions of supervisors.

No electronic devices are permitted during the examination.

All question papers and answer booklets are the property of the University and remain so at all times.

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Q 1. [10 marks]
(a) Explain the “attribute” and “uniform” variable qualifiers in OpenGL. (6 marks)

(b) Which variables (i.e. containing which type of data) would be declared as “attribute” and which ones would be declared as “uniform”, give examples? (4 marks)

Q 2. [10 marks]
(a) What is event mode programming and callback. (6 marks)

(b) Give two examples of events? (2 marks)

(c) What happens if a callback function is not defined for an event? (2 marks)

Q 3. [10 marks]
(a) What does posting a re-display (i.e. `glutPostRedisplay()`) do in OpenGL? (4 marks)

(b) What is a viewport? (3 marks)

(c) Give an example usage of viewport. (3 marks)

Q 4. [10 marks]
Consider an object defined by N vertices centred at location [2, 2, 2, 1] in homogeneous coordinates. Write the steps required to rotate this object about the same point and using a rotation matrix R of type `mat4`.

Q 5. [10 marks]
Briefly explain Flat Shading, Gouraud Shading and Phong Shading in OpenGL while mentioning where they are implemented in the graphics pipeline and their advantages/disadvantages.

Q 6. [10 marks]
(a) What is a quaternion? (2 marks)

(b) What advantages do quaternions have over transformation matrices? (6 marks)

(c) Which functionalities of transformation matrices cannot be performed by quaternions? (2 marks)

Q 7. [10 marks]
(a) Describe the two-part texture mapping process. (4 marks)

(b) Describe the three ways in which the second part can be performed. (6 marks)

NOTE: Equations are not required. Use appropriate diagrams for both parts of the question.

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