ELIZADE UNIVERSITY

ILARA-MOKIN

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
1st SEMESTER EXAMINATION
2017 / 2018 ACADEMIC SESSION

COURSE CODE: CSC 427

COURSE TITLE: Computer Graphics and Visualization

COURSE LEADER: Mr. Babalola Olusola

DURATION: 2 Hours

HOD's SIGNATURE

INSTRUCTION:

Candidates should answer ALL Questions in Both Sections.

Students are warned that possession of any unauthorized materials in an examination is a serious offence.

SECTION A : Answer all questions in Section A

1. What does invariant mean in computer graphics?

2. $p = \begin{bmatrix} 7 \\ 7 \\ 4 \end{bmatrix}$ $q = \begin{bmatrix} -7 \\ 7 \\ -4 \end{bmatrix}$ Is p = q? Solve and explain your answer.

3. $p = \begin{bmatrix} 8 \\ 6 \\ 4 \end{bmatrix}$ $q = \begin{bmatrix} 12 \\ 9 \\ 6 \end{bmatrix}$ i. Is p & q in the same direction? ii. What is p . q?

4. If $\mathbf{B} = \begin{bmatrix} x & y & z \end{bmatrix}$ what is $\mathbf{B^T}$

5. What can you say about two vector s and t if
   (a) s x t = 0 (b) s . t = 0

6. Choose values for m and n and compose a m x n matrix, call it K. State the order of K, the matrix you composed. Find 2.5K

7. What is the magnitude of $p = \begin{bmatrix} 4 & 4 & 4 \end{bmatrix}$?

8. State 5 industries where computer graphics is a major aspect of their operations. Briefly explain how computer graphics is used in the industries.

9. Why is mathematics pervalent in computer graphics? List 5 areas of mathematics and an area of physics that is mainly found in CG.

10. What are primitives in computer graphics, list some primitives.

11. List the various libraries and tools you would need if you were to use OpenGL. What is each of those used for?

12. Mention some companies involved in the OpenGL project.

13. What is the place of hardware in computer graphics? What is the interest in GPUs?

14. Why do computer games require intensive computation.

15. Computer displays are raster devices? Y/N? Explain. What are raster graphics? Vector graphics?

16. List some transformations and describe them mathematically.

17. RP + t ≠ R(P + t). Explain using visual aids.

18. What is the graphics pipeline?

19. What is a callback function? Give some OpenGL examples.

20. Mention some 10 things OpenGL can do.

21. If you can plot points, you can draw anything. Explain.

22. List three coordinate systems. Is there 1D? Support your answer with diagrams.

23. What is 3D? You've got 3D points, how would you plot them?

24. List some common vector operations in computer graphics.

25. What is the image buffer? Given a 240 x 200 image, what is the image buffer at 1bpp, 8bpp, 24bpp?

SECTION B: Answer one question in Section B.

1. We need to produce a cube in OpenGL. Explain how you would approach the problem. Give each step of the process from the analysis till the display of the cube on your computer screen. Note - you must write an OpenGL program among other things. (20 marks).

2. a. What is rendering? Give practical instances. Explain the graphics pipeline specifying at least 6 major phases in the pipeline (6 marks). **2b.** Explain 3 concepts in OpenGL lighting techniques (2 marks) **2c.** Mention 3 concepts in OpenGL shading techniques (2 marks). **2d.** Using diagrams, show 4 key transformations and their matrix (10 marks).

3. a. What is the difference between graphics and visualization? Briefly explain the visualization process (5 marks for good discrimination). **3b.** Consider this: **glVertex3f (0.75, 0.75, 0);** is this code snippet correct? Explain. (3 marks). **3c.** List and explain 3 special matrices (4 marks). **3d.** Choose values for m and m and compose a m x n matrix, call it J. Find $J + J^T$(4 marks). **3e.** Present a vector z. Find | z |, and thence change the direction and magnitude of z (4 marks).