



(Knowledge for Development)

KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR FOUR SEMESTER TWO EXAMINATIONS**

**FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER SCIENCE**

COURSE CODE : CSC 420

COURSE TITLE : COMPUTER GRAPHICS

DATE: 27/07/2018

TIME: 02:00 P.M – 4:00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE [30 MARKS]

- a. What is meant by the term computer graphics? [2 marks]
- b. Pixels and texels rarely map one-to-one: for this case, which two operations must be defined for textures to render correctly? [2 marks]
- c. How is the Z buffer used to make closer objects display in front of farther ones? [2 marks]
- d. Explain the trichromatic theory of color vision. [4 marks]
- e. How does OpenGL represent a transformation internally? [2 marks]
- f. Using a suitable diagrammatical illustration explain the process of image processing and generation as used in the study of multimedia technologies. Explain what happens at each stage. [10 marks]
- g. Using line segments for your examples, draw four different cases of clipping a line against a 2D viewport. [4 marks]
- h. Explain how gaming industry is impacting and shaping computer graphics [4 marks]

QUESTION TWO [20 MARKS]

- a. Interactive graphics has plenty of advantages over passive graphics. Discuss. [6 marks]
- b. Explain the detail of 2-D viewing transformation pipeline. [6 marks]
- c. As you are reading an advert you notice that a designer has confused raster graphics and vector graphics, explain to he clearly the differences and assist by further giving example of programs that could be used to generate each. [8 marks]

QUESTION THREE

A company wants to create an architectural renderer for a world which contains many cities, each city contains many buildings and each building is made up of two components.

- a. Give two advantages of using hierarchical modelling or scene graphs to model a scene. [2 marks]
- b. Draw an example tree structure (basic hierarchical model) to model a world with two cities, each city has two buildings and each building has two components. Label each node in your tree with a letter (e.g. node **A**). Label each *edge* connecting two nodes together as M_{AB} to represent the transformation from node **A** to node **B** (you do not need to specify what the transformations are). [4 marks]
- c. For each component at the bottom of the tree (i.e. the leaf nodes), write out the series of transformations required to transform this component (assuming the world has already been initialized). [2 marks]
- d. Give the difference between raster scan and vector scan. [4 marks]
- e. Explain the color image perceptual attributes. [4 marks]
- f. Explain the difference between a parametric description of an object and a non-parametric description. [4 marks]

QUESTION FOUR

- . Rotate the point (2, 0, 0) by 60 degrees about the axis (2, 0, 0). [4marks]
- a. i. In the context of Computer Graphics, what do we mean by a “*Transformation*” [2 marks]
- ii. Derive the transformation matrix for a translation by [3,4,5] followed by a reflection of the origin [0,0,0] [6 marks]
- b. Is it possible to construct a translation matrix for 3D objects using a 3x3 matrix? Give an explanation for your answer. [2 marks]
- c. Give an advantage and disadvantage of the basic OpenGL system not including an OS windowing routines. [6 marks]

QUESTION FIVE

- a. What is the homogenous transformation matrix for parallel projection and perspective projection? [4 marks]
- b. Explain miter join, round join and bevel join with a neat diagram [4 marks]
- c. The phong illumination model includes three kinds of lighting/reflection. For each give its name and a brief description. [6 marks]
- d. Draw a diagram illustrating the main parts of the graphics rendering pipeline. indicate at least one operation that occurs in each “*Box*“, and at least three operations performed on each vertices(or groups of vertices) [6 marks]