JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

UNIVERSITY SPECIAL/RESIT EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN COMPUTER SECURITY AND FORENICS

4TH YEAR 1ST SEMESTER 2019/2020 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: IIT 3416

COURSE TITLE: COMPUTER GRAPHICS

EXAM VENUE: **STREAM: BSC COMP SECURITY**

DATE: 3RD DECEMBER 2020   **EXAM SESSION:**

TIME: 2.00 HOURS

INSTRUCTIONS:

1. **Answer Question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on the question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE [30 MARKS]

(a) Define the following terms and concepts as applies to computer graphics [8 Marks]
  (i) P-frames   (iii) Anti-aliasing
  (ii) Bump texture   (iv) Ambient Occlusion
(b) Distinguish between *rasterization* and *scan conversion* as applies to computer graphics.
                                                                          [4 Marks]
(c) "Graphics hardware can be divided into three major categories of devices". Do you agree with this statement? Explain in support of your answer. [4 Marks]
(d) Explain how the interactive graphics display works. [3 Marks]
(e) Using a well-labelled diagram, briefly explain the *graphics pipeline process*. [4 Marks]
(f) An object point *P(x, y)* is translated into direction $v = a\mathbf{i} + b\mathbf{j}$ and simultaneously an observer moves in the direction *v*. Show that there is no apparent motion (from the point of view of the observer) of the object point. [3 Marks]
(g) Consider the limit of the iterated function sequence shown in the diagrams below (the shade part). Determine the fractal dimension of the limit object. [4 Marks]
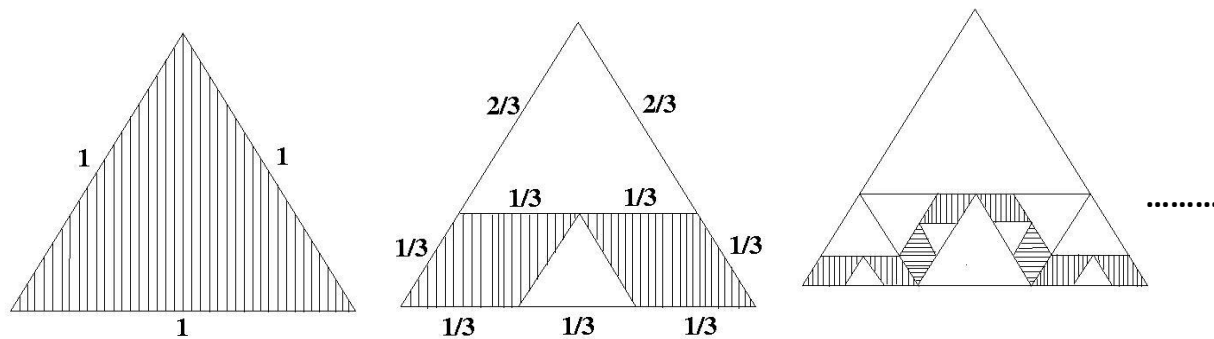
QUESTION TWO [20 MARKS]

(a) Using a well labelled diagram, give a broad overview of computer graphics putting in consideration the key inclusions: image synthesis, animation, hardware and system architecture, and applications. [8 Marks]
(b) Name and explain the four main areas in which applications of computer graphics can be classified. [8 Marks]
(c) Give four advantages of computer graphics. [4 Marks]

QUESTION THREE [20 MARKS]

(a) Give the importance in applications of *dot product* and *cross product* in computer graphics. [4 Marks]
(b) Name and explain the three basic methods used in generation of characters on a computer screen. [6 Marks]
(c) Using Bresenham's algorithm, determine the pixel location approximating the first octant of a circle having centre at (4, 5) and radius 4. [6 Marks]
(d) Compare the advantages and disadvantages of the Bresenham's line drawing algorithm with those of the Digital Differential Analyzer (DDA) algorithm. [4 Marks]

QUESTION FOUR [20 MARKS]

(a) Explain the basic principles of reflection transformation that guides the relation between point *P(x, y)* and its image *P'(x', y')*. [4 Marks]

(b) Explain the meaning of OpenGL and its role in computer graphics. [4 Marks]

(c) Below are statements about OpenGL that may be TRUE or FALSE. For each of the statements, cite with reasons whether TRUE or FALSE. [8 Marks]
(i) It can only draw a few basic shapes, including points, lines and triangles.
(ii) It has a large collection of functions that can be used to specify colors for geometric drawings.

(d) Briefly describe *homogeneous coordinates* and *affine transformation* as applied in computer graphics. [4 Marks]

QUESTION FIVE [20 Marks]

(a) "The Phong reflection model is often used together with Phong shading to shade surfaces in 3D computer graphics software"
(i) Briefly explain the underlined terms as applies to computer graphics. [9 Marks]
(ii) Suppose you are required to compute the normal $N = [N_x, N_z]$ on a line on a cylindrical object. Assuming only one light, co specular reflection, and uniform known reflection parameters. Incorporate the concept of Inverse Phong Reflection Model in your computation. [6 Marks]
(iii) Comment on a case where the object is not cylindrical. [2 Marks]
(iv) Identify one application of the Phong reflection model. [1 Mark]

(b) Explain any sampling technique used in ray tracing. [2 Marks]

- **END –**