



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS**

**DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN  
COMPUTER SECURITY AND FORENICS**

**4<sup>TH</sup> YEAR 1<sup>ST</sup> SEMESTER 2018/2019 ACADEMIC YEAR**

**MAIN CAMPUS**

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**COURSE CODE: IIT 3416**

**COURSE TITLE: COMPUTER GRAPHICS**

**EXAM VENUE:**

**STREAM: BSC COMP SECURITY**

**DATE: DECEMBER 2018**

**EXAM SESSION:**

**TIME: 2.00 HOURS**

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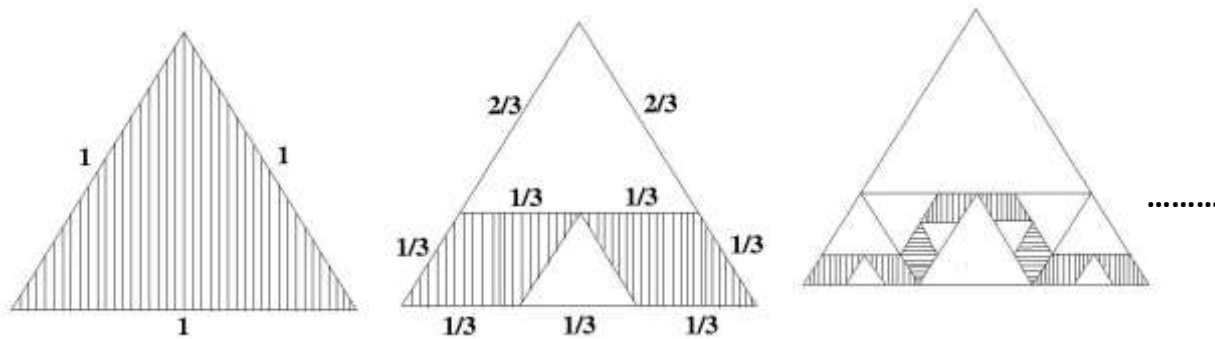
**INSTRUCTIONS:**

- 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) Pixel         | (iii) Anti-aliasing  |
| (ii) Bump texture | (iv) Gouraud Shading |
- (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  $v = ai + bj$  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]

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