

ZIMBABWE EZEKIEL GUTI UNIVERSITY



FACULTY OF SCIENCE, TECHNOLOGY, AGRICULTURE AND FOOD SYSTEMS
DEVELOPMENT

DEPARTMENT OF INFORMATION SYSTEMS

EXAMINATION PAPER

COURSE CODE: BIS415
COURSE TITLE: COMPUTER GRAPHICS
SPECIAL REQUIREMENTS: NONE
LEVEL: 4
EXAM DURATION: 3 hours
DATE: APRIL 2025

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INSTRUCTIONS TO CANDIDATES:

1. Answer any **four** questions
2. Number your answers accordingly
3. Start each question on a new page
4. You can use a calculator.

Question 1

- a) Explain 2 D translation with diagrams. [4 marks]
- b) Using the Bresenham's line drawing algorithm scan convert the line starting at point (6,6) and ending at (20,18) [6 marks]
- c) Consider three different raster systems with resolutions of 540 x 380, 1080 x 924 and 1560 x 1048. What size is frame buffer (in bytes) for each of these systems to store 12 bits per pixel? [5 Marks]
- d) List the properties of Berzier curves [5 marks]

Question 2

- a) To display in a computer screen the programmer needs to poke the video memory.
Discuss how memory mapping works [6 Marks]
- b) Outline FOUR the disadvantages of OLED computer screens [4 Marks]
- c) In transformations rotate by 90 degree clockwise an object with the following endpoints (2,2) (3,4) (4,2) [4 Marks]
- d) Explain down four main advantages of laser printers? [6 Marks]

Question 3

- a) Consider two raster systems with resolutions of 640×480 and 1280×1024 .
How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second? [6 marks]
- b) Discuss the problems associated with the Digital Differential Analyzer line-drawing algorithm [8 marks]
- c) In realistic rendering why is bump mapping important [6 Marks]

Question 4

- a) Explain with a diagram the raster scan display technique. [4 marks]
- b) Consider the line from $(0, 0)$ to $(4, 6)$.
Use DDA algorithm to rasterize this line. [4 marks]
- c) A point $(4, 3)$ is rotated counter-clockwise by an angle of 45° . Find the rotation matrix and the resultant point. [4 marks]
- d) Explain Arc generation technique using DDA algorithm. [4 marks]
- e) Use the Cohen Sutherland algorithm to clip two lines $P1(40,15)$ - $P2(75,45)$ and $P3(70,20)$ - $P4(100,10)$ against a window $A(50,10)$, $B(80,10)$, $C(80,40)$, $D(50,40)$. [4 marks]

Question 5

- a) Explain the term Global Illumination [2 Marks]
- b) Differentiate between orthographic and oblique projection [4 marks]

d) Differentiate between ambient and diffuse light reflections [4 Marks]

e) In realistic rendering why is bump mapping important [6 Marks]

Question 6

a) Derive the expression for decision parameter used in Bresenham's Circle algorithm.

[4 marks]

b) Apply the Shearing transformation to square with A(0,0), B(1,0), C(1,1) and D(0,1) as given

below :

i. Shear parameter value of 0.5 relative to the line $Y_{ref} = -1$;

[2 marks]

ii. Shear parameter value of 0.5 relative to the line $X_{ref} = -1$;

[2 marks]

c) Write an algorithm to clip a line using Liang Barsky line clipping algorithm.

[6 marks]

d) Explain 2D translation with the aid of a diagram

[6 marks]

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