



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

SIT 343: COMPUTER GRAPHICAL SYSTEMS

DATE: 18/4/2023

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

1. Answer question **ONE** in SECTION A and any other **TWO** questions in SECTION B
2. Marks are awarded for clear and concise answers

SECTION A

QUESTION ONE COMPULSORY - (30 MARKS)

- a) Using examples, explain the following transformations: (6 marks)
- i. Reflection
 - ii. Shear mapping
- b) Define the following terms: (8 marks)
- i. Computer graphic
 - ii. Scalar
 - iii. Point
 - iv. Line
- c) Briefly explain the term scan conversion. (2 marks)
- d) To display in a computer, screen the programmer needs to poke the video memory. Discuss how memory mapping works (6 marks)
- e) Using key references explain the history of computer graphics. (8 marks)

QUESTION TWO (20 MARKS)

- a) Differentiate between a local illumination model and global illumination model (4 marks)
- b) Draw a line using the digital Differential analyzer line drawing algorithm starting at point (4,4) and ends at point (12,10) (8 marks)
- c) Discuss the Cohen- Sutherland line clipping algorithm. (8 marks)

QUESTION THREE (20 MARKS)

- a) Explain the main functions used in OpenGL. (8 marks)
- b) Explain the meaning of the term parallel projection and explain where it is most applicable. (6 marks)
- c) Find the angle between vectors (3, 7) and (-4, 5). (6 marks)

QUESTION FOUR (20 MARKS)

- a) Differentiate between diffuse reflection and specular reflection. (4 marks)
- b) i) Derive the following Rotation Identity Matrix: (4 marks)
$$x' = x \cos(\theta) - y \sin(\theta)$$
$$y' = x \sin(\theta) + y \cos(\theta)$$
 - ii) Find the transformed point, P', caused by rotating P= (3, 2) about the origin through an angle of 90°. (4 marks)
- c) Using a suitable diagram briefly explain the various components and their functions in a CRT. (8 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the following surface detection methods: (8 marks)
 - i. Z-Buffer Method
 - ii. Binary Space Partitioning(BSP) Tree Method
- b) Draw a circle centered at point (5,5) and has a radius of 6 units using the polar coordinates method (6 marks)
- c) Assuming that a certain full-color (24 bit per pixel) RGB raster system has a 512 by 512 frame buffer, how many distinct color choices (intensity levels) would be available? (6 marks)