AFRICA UNIVERSITY
A United Methodist-Related Institution

"Investing in Africa's Future"

COLLEGE OF ENGINEERING AND APPLIED SCIENCES

NCSC 300: COMPUTER GRAPHICS

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2024

LECTURER: DR CRY KURANGAA

TIME: 3 HOURS

INSTRUCTIONS

You are required to answer questions as instructed in each section

Start **each** question on a new page in your answer booklet

Answer *all* questions in Section **A** and any *three* from Section **B**

Credit will be awarded for logical, systematic and neat presentations

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Section A (40 Marks)
Answer all questions in this section

Question 1 (Compulsory)

a) Explain how the cathode ray tube operates. Include in your explanation the following:
   (i) How an electron gun works. [4]
   (ii) Electrostatic focusing. [3]
   (iii) Magnetic focusing. [3]
   (iv) Magnetic deflection. [3]
   (v) Electrostatic deflection. [3]
   (vi) How a glow is produced. [4]

b) With the aid of an example, discuss Bresenham's line drawing algorithm. [10]

c) Using **OpenGL**, pick a shape of your choice in GLUT such as a torus. Perform a rotation at centre (0,0). [10]

Section B (60 Marks)

Answer any three questions from this Section

Question 2

a) Discuss the concepts of clipping window, viewport, display window, and their relations in a viewing pipeline. [12]

b) Derive the matrix that represents the rotation of an object P by $30°$ about the origin. Find the new coordinates of the point $P(2,-4)$ after the rotation. [8]

Question 3

a) Compare and contrast a direct storage scheme and Color lookup storage. [8]

b) Explain the following virtual reality technologies:
   (i) Immersion [4]
   (ii) Oculus venues; and [4]
   (iii) Human in the loop; [4]

Question 4

a) Explain a viewing pipeline. [10]

b) Apply the Cohen Sutherland line clipping algorithm to clip the line segment with coordinates $(30, 60)$ and $(60, 25)$ against the window with $(X_{min}, Y_{min}) = (10, 10)$ and $(X_{max}, Y_{max}) = (50, 50)$. [10]

Question 5

a) Given a circle radius $r = 10$, demonstrate the midpoint circle algorithm by determining positions along the circle octant in the first quadrant from $x = 0$ to $x = y$. [10]

b) Explain how texture mapping can be used to improve the visual realism of graphical scenes. [4]

d) Discuss the application of computer graphics in the Entertainment domain. [6]

Question 6

a) Discuss an RGB color model. [8]

b) Explain the basic illumination model. [6]

c) Compare and contrast perspective projection and parallel projection. [6]

********** **END OF EXAMINATION**********