Inspiring Innovation and Leadership

KARATINA UNIVERSITY

UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR

THIRD YEAR **SECOND** SEMESTER EXAMINATION

FOR THE DEGREE OF

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY/ BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: COM 331

COURSE TITLE: COMPUTER GRAPHICS

DATE: 17TH APRIL, 2024 **TIME: 12:00-2:00 PM**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

INSTRUCTIONS:

Answer Question 1 and any other 2 questions

Show workings for all computations

QUESTION ONE (30 MARKS)

a. Describe the following terms as used in computer graphics: [4 marks]

   i. Frame buffer
   ii. Rasterization

b. List any FOUR features of OpenGL [4 marks]

c. Differentiate between the following terms as used in computer graphics

   i. Reflection as a 2D transformation and rotation as a 2D transformation [2 marks]
   ii. Diffuse reflection and specular reflection. [2 marks]
   iii. Pixels and texels [2 marks]

d. Goroud shading results to rough looking images in appearance as compared to phong shading. Elaborate on this statement. [4 marks]

e. Differentiate between Pixels and Texels as used in computer graphics. [2 marks]

f. Use a diagram to illustrate the architecture of OpenGL. [6 marks]

g. Describe the most appropriate type of projections to apply for a computer aided design tool used by an architect. [2 marks]

h. Describe the following methods as used in Camera projections in OpenGL. [2 marks]

   i. glMatrixMode()
   ii. glFrustum

QUESTION TWO (20 MARKS)

a. Explain the term refresh as used in Computer Graphics. [2 marks]

b. Write a HTML code that creates a 600px by 300px canvas. [4 marks]

c. Write WebGL code that contextualizes the canvas in (c) above [6 marks]

d. Write code that displays a rectangle filled with the colour green. [8 marks]

QUESTION THREE (20 MARKS)

a. Explain THREE advantages of WebGL compared to plain OpenGL. [6 marks]

b. Given that a line is expressed by the equitation y=mx+c, assume two points a(x0,y0)and b(x1,y1). Derive the equation for y and m and write an algorithm for a computer programme that will plot a line. [8 marks]

c) Explain the importance of the following tools in webgl (i) Html- (2MKS) (ii) CSS (2MKS) (iii) Javascript 2MKS

QUESTION FOUR (13 MARKS)

An image has the following coordinates:

$$A = \begin{bmatrix} 6 \\ 0 \\ 2 \end{bmatrix}, \qquad B = \begin{bmatrix} 6 \\ 4 \\ 2 \end{bmatrix}$$

Required:

a. Compute the new coordinates of the points in the image if the image is zoomed out by a factor of 2. [4 marks]

b. Compute the new coordinates of the points if the image is reflected along the y-axis. [4 marks]

c) determine the cross product of A and B (6MKS)

d) determine the normal of the vector perpendicular to A and B(4MKS)

QUESTION FIVE (20 MARKS)

a. Describe any TWO tasks carried out by a dedicated graphics processor. [4 Marks]

b. Differentiate between the following terms as used in computer graphics:

i. interlaced and non-interlaced displays [2 marks]

ii. Physical and Synthetic images as used in computer graphics. [2 marks]

iii. GLU and GLUT components of an OpenGL Library [2 marks]

c. A point C on a sphere is placed such that the light bouncing on it is reflected at 90 degrees. Given that A and B are two vectors parallel to the surface of the sphere at point C, compute the surface normal at point C. [10 marks]