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TECHNICAL UNIVERSITY OF KENYA

FACULTY OF APPLIED SCIENCES AND TECHNOLOGY

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION SERIES

FIRST SEMESTER EXAMINATIONS 2018/2019

THIRD YEAR EXAMINATIONS FOR THE DEGREE OF

BACHELOR OF TECHNOLOGY IN COMPUTER TECHNOLOGY

BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY

BACHELOR OF TECHNOLOGY IN COMMUNICATIONS AND COMPUTER NETWORKS

**ECII 3107/ECSI 3107/ECCI 3107: COMPUTER GRAPHICS**

TIME: 2 Hours

**Instructions to candidates:**

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This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

This paper consists of 4 printed pages

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

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**QUESTION ONE (30 MARKS) COMPULSORY**

1. Define scan conversion **(2 Marks)**
2. Explain application of computer graphics in the following areas. Include relevant example in each case **(9 marks)**
3. State six modelling attributes (elements for drawing) **(3 Marks)**
4. The figure below gives an illustration of various linear transformations. Identify and explain the kind of transformations involved. **(7 Marks)**



1. Image 1 (magenta)
2. Original object (blue)
3. Image 2 (red)
4. Image 3 (green)
5. Given the OpenGl code below, draw it’s the output **(9 Marks)**

#include <windows.h>

#include <GL/glut.h>

void initGL() {glClearColor(0.0f, 0.0f, 0.0f, 1.0f); }

void display() {

glClear(GL\_COLOR\_BUFFER\_BIT);

glBegin(GL\_QUADS);

glColor3f(1.0f, 0.0f, 0.0f);

glVertex2f(-0.8f, 0.1f); glVertex2f(-0.2f, 0.1f);

glVertex2f(-0.2f, 0.7f);glVertex2f(-0.8f, 0.7f);

glColor3f(0.0f, 1.0f, 0.0f);

glVertex2f(-0.7f, -0.6f);glVertex2f(-0.1f, -0.6f);

glVertex2f(-0.1f, 0.0f);glVertex2f(-0.7f, 0.0f);

glColor3f(0.2f, 0.2f, 0.2f);

glVertex2f(-0.9f, -0.7f);glColor3f(1.0f, 1.0f, 1.0f);

glVertex2f(-0.5f, -0.7f);glColor3f(0.2f, 0.2f, 0.2f);

glVertex2f(-0.5f, -0.3f);glColor3f(1.0f, 1.0f, 1.0f);

glVertex2f(-0.9f, -0.3f);

glEnd();

glBegin(GL\_TRIANGLES);

glColor3f(0.0f, 0.0f, 1.0f);glVertex2f(0.1f, -0.6f);

glVertex2f(0.7f, -0.6f);glVertex2f(0.4f, -0.1f);

glColor3f(1.0f, 0.0f, 0.0f); glVertex2f(0.3f, -0.4f);

glColor3f(0.0f, 1.0f, 0.0f); glVertex2f(0.9f, -0.4f);

glColor3f(0.0f, 0.0f, 1.0f); glVertex2f(0.6f, -0.9f);

glEnd();

glBegin(GL\_POLYGON);

glColor3f(1.0f, 1.0f, 0.0f);glVertex2f(0.4f, 0.2f);

glVertex2f(0.6f, 0.2f);glVertex2f(0.7f, 0.4f);

glVertex2f(0.6f, 0.6f);glVertex2f(0.4f, 0.6f);glVertex2f(0.3f, 0.4f);

glEnd(); glFlush();

}

int main(int argc, char\*\* argv) {

glutInit(&argc, argv);

glutCreateWindow("Vertex, Primitive & Color");

glutInitWindowSize(320, 320);

glutInitWindowPosition(50, 50);

initGL();

glutMainLoop();

return 0;

**QUESTION TWO (20 MARKS)**

1. Given is a function *drawTriangle()* which draws a wire frame triangle in the xy-plane as shown in the image below on the left. Write OpenGl code segment that will produce figure shown (in figure 2) **(6 Marks)**



1. Using relevant examples, discuss the following activities in computer graphics **(9 Marks)**
2. Color and shading:
3. Rasterization:
4. Hidden surface removal:
5. By use of a cube, distinguish between parallel and perspective projection. **(5 Marks)**

**QUESTION THREE (20 MARKS)**

1. Using a diagram explain the graphics pipeline (forward) **(6 Marks)**
2. Explain the terms given below **(4 Marks)**
3. Raster Scan Display Processor
4. Vector graphics.
5. Aspect Ratio
6. Using typical examples, explain the clipping of the following
7. Line clipping **(6 Marks)**
8. Text clipping **(4 Marks)**

**QUESTION FOUR (20 MARKS)**

1. Explain the following device input modes **(6 Marks)**
2. Event Mode
3. Sample Mode
4. Request Mode
5. Draw the shape produced by the openGl function below **(4 Marks)**

void display(void)

{

// clear all pixels in frame buffer

glClear(GL\_COLOR\_BUFFER\_BIT);

glColor3f(0.0, 0.0, 0.0); **glBegin(GL\_QUADS);** **glVertex2f(300, 100);** **glVertex2f(100, 300);** **glVertex2f(100, 100);** **glVertex2f(200, 0);** glEnd(); glFlush();

1. Develop DDA line drawing algorithm and use it to draw a line of your choice **(10 Marks)**

**QUESTION FIVE(20 MARKS)**

1. Briefly explain the history of computer graphics **(7 Marks)**
2. Draw the shape produced by the OpenGl code segment shown below **(5 Marks)**

glTranslatef(2.0, 0.0, 0.0);

glutSolidSphere(1.0, 32, 32);

glPushMatrix();

glTranslatef(2.0, 2.0, 0.0);

glutSolidSphere(1.0, 32, 32);

glPopMatrix();

glTranslatef(-2.0, 0.0, 0.0);

glutSolidSphere(1.0, 32, 32);

glTranslatef(0.0, 2.0, 0.0);

glutSolidSphere(1.0, 32, 32);

glPopMatrix();

1. Prove that simultaneous shearing in both direction (X & y direction) is not equal to the composition of pure shear along x-axis followed by pure shear along y-axis. **(5 Marks)**
2. Distinguish between the following terms **(3 Marks)**
3. Computer Grapidcs Metafile
4. Programmer's Hierarchical Interactive Graphics System (PHIGS)