



MACHAKOS UNIVERSITY

University Examinations for 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 305: COMPUTER GRAPHICS

DATE: 14/12/2017

TIME: 11.00-1.00 PM

INSTRUCTIONS

Answer question **ONE** and **Any** other **Two** among the four selective questions

QUESTION ONE (COMPULSORY)

- a) Differentiate between: (10 marks)
- 2D and 3D
 - Frame buffer and resolution
 - Conformal and Affine transformation
 - Computer Graphics Metafile and Programmer's Hierarchical Interactive Graphics System
 - Pixmap and Bitmap
- b) Explain any four 2D Computer Graphics that are closely related to the six output functions of. **Graphical Kernel System (GKS)** (6 marks)
- c) Define computer graphics and describe the application of computer graphics in education. (6 marks)
- d) Draw the output of the openGl program shown below (8 marks)

```
#include<GL/glut.h>
#include<stdio.h>
void display()
{
    glClear(GL_COLOR_BUFFER_BIT);
    glColor3f(1.0,0.0,0.0);
    glPointSize(2.0);
    glBegin(GL_POINTS);
```

```

    glVertex2f(0.0,0.0);
    glVertex2f(0.0,0.5);
    glEnd();
    glBegin(GL_LINES);
        glVertex2f(0.0,0.0);
        glVertex2f(0.0,0.5);
    glEnd();
    glBegin(GL_POLYGON);
        glVertex2f(0.0,0.0);
        glVertex2f(0.0,0.5);
    glEnd();
    glFlush();
}

void myinit()
{
    glClearColor(0.0,0.0,0.0,1.0);
    gluOrtho2D(-1.0,1.0,-1.0,1.0);
}

void main(int argc, char **argv)
{
    glutInit(&argc,argv);
    glutInitDisplayMode(GLUT_RGB|GLUT_SINGLE);
    glutInitWindowSize(500,500);
    glutInitWindowPosition(0,0);
    glutCreateWindow("Simple demo");
    myinit();
    glutDisplayFunc(display);
    glutMainLoop();
}

```

QUESTION TWO (20 MARKS)

- a) Draw on Cartesian plane the image drawn by code segment below (5 marks)

```

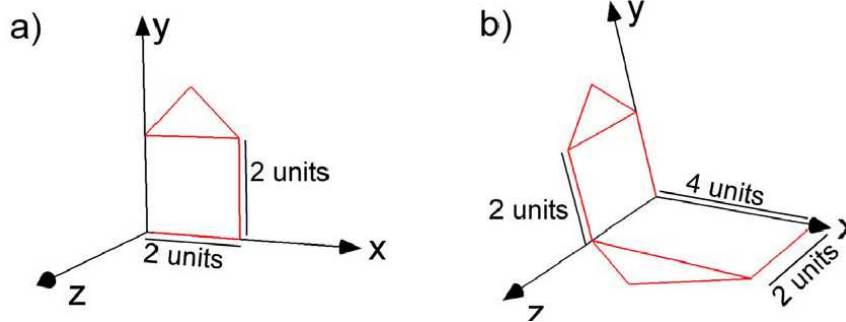
glTranslatef(2.0, 0.0, 0.0);
glutSolidSphere(1.0, 32, 32);
glPushMatrix();
glTranslatef(2.0, 2.0, 0.0);
glutSolidSphere(1.0, 32, 32);
glPopMatrix();
glTranslatef(-2.0, 0.0, 0.0);
glutSolidSphere(1.0, 32, 32);
glTranslatef(0.0, 2.0, 0.0);
glutSolidSphere(1.0, 32, 32);
glPopMatrix();

```

- b) Briefly explain the purpose of any four coordinate systems (spaces) that you may encounter in a rendering pipeline. (8 marks)
- c) Explain orthographic projections by using an example of a diagram of house (7 marks)

QUESTION THREE (20 MARKS)

- a) Use the Cohen Sutherland algorithm to clip line P1 (70,20) and p2(100,10) against a window lower left hand corner (50,10) and upper right hand corner (80,40). (10 marks)
- b) Given is a function *drawHouse()* which draws a wire frame house in the xy-plane as shown in part (a) of the image below. Write OpenGL transformations for converting (a) into (b) (5 marks)



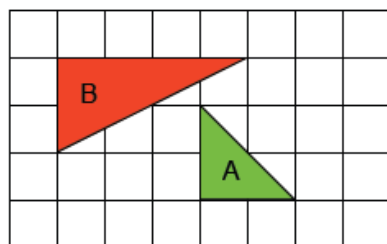
- c) Consider two raster systems with the resolutions of 640 x 480 and 1280 x 1024.
- How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second (3 marks)
 - What is the access time per pixel in each system (2 marks)

QUESTION FOUR (20 MARKS)

- a) Explain three basic elements for drawing in computer graphics (6 marks)
- b) Explain Midpoint circle drawing algorithm (8 marks)
- c) Using a diagram, explain window-to-viewport mapping (6 marks)

QUESTION FIVE (20 MARKS)

- a) Define Bresenham algorithm and develop the Bresenham's line drawing to draw lines of any slope. (11 marks)
- b) Describe the transform needed to transform the triangle from A to B in Figure below (5 marks)



- c) State any five applications of fractal geometry (4 marks)