



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 305: COMPUTER GRAPHICS

DATE: 9/11/2020

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer question ONE and any other TWO questions.

QUESTION ONE (30 MARKS) (COMPULSORY)

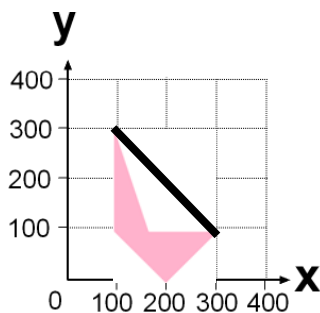
- a) Explain the syntax of the functions below (6 marks)
- i. putpixex()
 - ii. outtextxy()
 - iii. ellipse()
- b) Given a triangle A(0,0) , B(2,2) , C(4,2), draw the image under the following transformations (9 marks)
- i. Rotation through the angle 90 and centre (0,5)
 - ii. Reflection of the line $y = -2x - 1$
 - iii. Shear of 2 along a diagonal line forming 45° with x axis
- c) Differentiate between the following (10 marks)
- i. dithering and thresholding
 - ii. GLU and GLUT
 - iii. Polyline and cell-array
 - iv. Programmer's Hierarchical Interactive Graphics System and Computer Graphics Metafile
 - v. B-Spline curve and Spline

- d) Graphically draw the shape produced by the sectional code below (5 marks)

```
GLfloat p1[3] = {0,0,1};
GLfloat p2[3] = {1,0,1};
GLfloat p3[3] = {1,1,1};
GLfloat p4[3] = {0,1,1};
glBegin(GL_POLYGON);
glcolor3f(0.0,0.0,0.0);
glVertex3fv(p1);
glVertex3fv(p2);
glVertex3fv(p3);
glVertex3fv(p4);
glEnd();
```

QUESTION TWO (20 MARKS)

- a) Differentiate parallel and perspective projections by using an example of a diagram of a house (7 marks)
- b) Develop a DDA algorithm for line A(4,5) and B(10,10) and draw the line (7 marks)
- c) Write a an opengl code to display the shape shown below (6 marks)



QUESTION THREE (20 MARKS)

- a) Explain the application of computer graphics in the following areas (4 marks)
- i. Virtualization
 - ii. Image processing
- b) Explain the polygon filling and seed fill algorithm (6 marks)
- c) Suppose RGB raster system is to be designed using an 8 inch X 10 inch screen with a resolution of 100 pixels per inch in each direction.

- i. If we want to store 6 bits per pixel in the frame buffer, how much storage (in bytes) do we need for frame buffer? (3 marks)
 - ii. What is the access time per pixel if the system refreshes at the rate of 60 frames per second? (2 marks)
- d) Explain how the influence of the following can be calculated in an illumination model
- i. Light source
 - ii. Object surface (5 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the following colour schemes (6 marks)
- i. RGB
 - ii. CMY
 - iii. HSV
- b) Discuss the following using relevant examples
- i. Line clipping using Cohen Sutherland algorithm (6 marks)
 - ii. Test clipping (3 marks)
- c) Draw the output of the openGL sectional code to below (5 marks)

```
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();
}

```

QUESTION FIVE (20 MARKS)

- a) Explain three basic kinds of computer file font format (6 marks)
- b) Using a diagram, explain general 3D viewing pipeline (5 marks)
- c) Write the equation for the conversion of RGB to CMY colour schemes (3 marks)
- d) Explain the following terms (6 marks)
 - i. Key frame animation
 - ii. Inverse kinematics
 - iii. Image Morphing