



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 305: COMPUTER GRAPHICS

DATE: 23/3/2021

TIME: 2:00 – 4:00 AM

INSTRUCTION: Answer Question ONE and any other TWO Question

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) Differentiate between the following (8 marks)
- Image and picture
 - Computer graphics and image processing
 - Polyline and cell-array
 - Programmer's Hierarchical Interactive Graphics System and Computer Graphics Metafile
- b) Write OpenGL code to produce the following images
- Rectangle (5 marks)
 - Triangle strip (5 marks)
- c) List any six applications of computer graphics (6 marks)
- d) Explain the syntax of the functions below (6 marks)
- putpixmap()
 - outtextxy()
 - ellipse()

QUESTION TWO (20 MARKS)

- a) Given a line A(0,0) and B(5,5), draw the image under the following transformations
- Identity (2 marks)
 - Scaling by factor of 3 (2 marks)
 - Translation by 2 in the x (2 marks)
 - Rotation through the angle 60 degrees (3 marks)
 - Reflection of the line $y = -2x - 1$ (4 marks)

- b) With relevant examples, discuss two coordinate systems common in graphics (4 marks)
- c) List any three common color schemes used in computer graphics (3 marks)

QUESTION THREE (20 MARKS)

- a) Explain four major operations performed in computer graphics (8 marks)
- b) Write polygon filling algorithm (6 marks)
- c) Outline the steps of Window to viewport mapping (6 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the following OpenGL attributes (9 marks)
- i. `glClearColor(1.0, 1.0, 1.0, 0.0);`
 - ii. `glPointSize(2.0);`
 - iii. `glClear(GL_COLOR_BUFFER_BIT);`
- b) List any five applications of fractal graphics (5 marks)
- c) Using appropriate diagram, explain perspective projection (6 marks)

QUESTION FIVE (20 MARKS)

- a) Describe clipping including relevant examples (8 marks)
- b) 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();
}

```

- c) Explain a S-Pline curve (4 marks)
- d) Explain the following terms (3 marks)
- i. Key frame animation
 - ii. Inverse kinematics
 - iii. Image Morphing