



MACHAKOS UNIVERSITY

University Examinations for 2023/2024 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

**BACHELOR OF SCIENCE (TELECOMMUNICATION AND INFORMATION
TECHNOLOGY)**

EEE 518 DIGITAL IMAGE PROCESSING

DATE:

TIME:

INSTRUCTIONS

This paper consists of FIVE Questions.

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

Write your University number on the answer sheet.

This paper consists of 3 printed pages

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

QUESTION ONE [30MARKS]

- a) Write the expression to find the number of bits to store a digital image. Find the number of bits required to store a 256×256 image with 32 gray levels **[3Marks]**
- b) Discuss briefly the principle of color model, its hardware orientation and applications. **[4Marks]**
- c) Explain the basic concepts of image sampling and quantization. **[6Marks]**
- d) Inverse filter may encounter numerical problem in practice. Provide a solution to overcome instability **[2marks]**
- e) Discuss advantage and disadvantage of global and local histogram equalization. **[5Marks]**
- f) In the field of multimedia and graphic design, data compression plays major role in enhancing effectiveness of memory utilization. In your own context show the importance of compression. **[6Marks]**
- g) Show how image restoration is achieved through inverse filtering approach. **[4Marks]**

QUESTION TWO [20MARKS]

- a) Integrate the need for various steps in digital image processing. **[10Marks]**
- b) Using illustration, demonstrate how visual perception model operates hence contrast its conventional model with Digital Image Processing system. **[10Marks]**

QUESTION THREE [20MARKS]

- a) What is meant by image enhancement by point processing? Discuss any two methods in it. **[12Marks]**
- b) Demonstrate the principle of histogram usefulness in image enhancement. **[8Marks]**

QUESTION FOUR [20MARKS]

- a) Deduce an expression of smoothening in image processing through Wiener filter and enlist its importance. **[8Marks]**
- b) Using schematic diagram, explain the functional block of JPEG standard. **[12Marks]**

QUESTION FIVE [20MARKS]

- a) Explain the concept of Huffman coding Algorithm and using numerical example show its importance in image compression. **[14Marks]**
- b) A source emits three symbol **A, B, C** with probabilities **{0.5 and 0.25}** respectively. Construct an arithmetic code to encode the word '**C, A, B**' **[6Marks]**