

KENYA METHODIST UNIVERSITY

END OF TRIMESTER I EXAMINATION, APRIL 2008

Faculty : Science and Social Studies
Department : Computer and Information Science
Course Code : COMP 431
Course Title : Digital Image Processing
Time : 2 hours

Instructions : Answer question one and any other two questions

Question ONE - Compulsory

a) Define the following terms as used in digital image processing:

- i) Sampling
- ii) Digital image
- iii) Quantization
- iv) Dithering
- v) Noise [10 marks]

b) Describe the image processing task of obtaining by automatic process, the postal codes from envelopes. [5 marks]

c) Compute the discrete Fourier transform (forward fast Fourier transform) for the following sequence

$$F = [2, -3, 4, -5] \quad [5 \text{ marks}]$$

d) What does the function *im2uint8* in MATLAB do? [2 marks]

e) Salt and pepper noise, also called impulse noise or shot noise can be caused by sharp, sudden disturbances in the image signal; its appearance is randomly scattered white and black pixels over the image. Briefly explain four (4) filtering methods used to remove this noise. [8 marks]

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

Question TWO

a) Image processing may be classified into three classes:

- i) Transforms
- ii) Neighborhood processing
- iii) Point operation

Describe each of these classes in details. [12 marks]

b) With the aid of an example, illustrate the implementation of pixel multiplication using MATLAB commands. [8 marks]

Question THREE

a) Describe how Floyd and Steinberg error diffusion algorithm works explaining why it is appropriate during quantization. [12 marks]

b) Explain the MATLAB commands that are use to perform the following conversion tasks

- i) Indexed image to grayscale image
- ii) RGB image to indexed image
- iii) Indexed image to RGB image
- iv) RGB image to grayscale image [8 marks]

Question FOUR

a) The one dimensional discrete Fourier transform (DFT) satisfies many useful and important properties. Discuss these properties. [16 marks]

b) One effective algorithm used for DFT is the fast Fourier transform. Describe how it works. [4 marks]

Question FIVE

a) Differentiate between lossless and lossy compression. [4 marks]

b) Discuss the following:

- i) Huffman Coding
- ii) Huffman decoding
- iii) Run length encoding
- iv) JPEG algorithm [16 marks]