

## BE8-R4: DIGITAL IMAGE PROCESSING

### NOTE:

1. Answer question 1 and any FOUR from questions 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.
  - a) Explain the steps of image processing.
  - b) What do you mean by Digitization of Image?
  - c) Explain the operation of 3X3 Laplacian mask.
  - d) Define 4-adjacent, 8-adjacent & m-adjacent with example.
  - e) Differentiate between Checkboard effect and False contouring.
  - f) Define inverse filtering.
  - g) Compare Huffman coding and arithmetic coding.

(7x4)

2.
  - a) Apply contrast stretching technique on 3 bit gray level image of size 4 x 4.

2	1	2	1
4	5	5	6
3	2	1	4
6	2	1	6

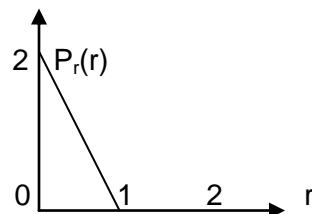
- b) Explain the concept of Karhunen-Loeve (K-L) transform.

(9+9)

3.
  - a) How many bits would be required to store an image of size 240 x 340 and 64 levels of grey shades? How many bits would be required to store a colored image with the same number of levels for each color components?
  - b) Give names & functioning of various image sensing and acquisition devices.
  - c) What is smoothing filters?

(9+5+4)

4.
  - a) What is Image Enhancement? Explain the histogram processing and equalization used in enhancement and apply on the following density function:



- b) Show that the discrete Fourier transform and its inverse are periodic function.
  - c) What is difference between Spatial Domain methods & frequency domain methods of Image Enhancement?

(8+4+6)

5.

- a) With the help of block diagram describe the Image Compression models.
- b) Discuss the limitation of LZW. Write the advantages of LZW over Huffman coding.
- c) What is the concept of Truncation compression?

(8+6+4)

6.

- a) With the help of degradation model explain the restoration process of an image.
- b) Differentiate between Multi-modal and Multi-spectral image processing.
- c) Explain LEAST MEAN SQUARE (WIENER) FILTER.

(7+6+5)

7.

- a) If two functions  $f(x)$  and  $g(x)$  are as follows:

$$f(x) = \begin{cases} 1 & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad g(x) = \begin{cases} \frac{1}{2} & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Find the convolution of  $f(x)$  and  $g(x)$ .

- b) What are color models? Explain the CMY color model.
- c) Discuss Quad tree Decomposition of an image.

(8+5+5)