

BE8-R3: DIGITAL IMAGE PROCESSING

NOTE:

1. Answer question 1 and any FOUR questions from 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 role of knowledge base in image processing?
- b) What do you mean by the term representation in the context of image processing?
- c) What do you mean by linear operator to the images?
- d) Give the formula for Butterworth lowpass filters and explain different variables in it.
- e) How can we perform the conversion of image in RGB color model into CMY model?
- f) Give three texture properties, which can be derived from first-order statistics.
- g) What is LZW encoding? Give its applications.

(7×4)

2.

- a) What do you mean by compression of an image? Compare lossless and lossy compressions with examples.
- b) What is Run Length Encoding (RLE)? Explain with an example.
- c) Discuss Huffman coding Algorithm.
- d) What is Arithmetic coding? Compare Arithmetic coding with Huffman coding.
- e) Give basic encoding method for transform based image compression.

(3+3+4+4+4)

3.

- a) What is algebraic representation of a digital color image?
- b) Give RGB color model. Discuss the conversion of RGB color space onto YUV, YIQ, and YCrCb Space and compare them.
- c) What is syntactic texture description? Give an algorithm for shape chain grammar texture generation.
- d) How can a texture classification problem be transformed into a graph recognition problem?

(2+6+6+4)

4.

- a) Discuss minimum mean square error filtering.
- b) Compare minimum mean square error filtering with inverse filtering.
- c) What is gray-level interpolation? Give one scheme for gray-level interpolation.

(8+4+6)

5.

- a) What do you mean by 'opening' and 'closing'? Explain each of them with examples.
- b) What is non-uniform sampling and non-uniform quantization? Give specific applications.
- c) Give one specific scheme for content-based image retrieval.

(6+6+6)

6.

- a) Develop an algorithm for converting a one-pixel-thick m-path to a 4-path.
- b) Show that the boundary of the region is a closed path.
- c) Give a 3 x 3 mask for performing unsharp masking in a single pass through an image.
- d) What are the basic steps in frequency domain filtering?

(6+4+4+4)

7.

- a) Discuss different coding systems defined by JPEG standard.
- b) Explain region splitting and merging with an example.
- c) Suppose that a digital image is subjected to histogram equalization. Show that a second pass of histogram equalization will produce exactly the same result as the first pass.
- d) Discuss the limiting effect of repeatedly applying 3 x 3 lowpass spatial filter to a digital image. You may ignore border effects.

(6+4+4+4)