

C7-R4: DIGITAL IMAGE PROCESSING & COMPUTER VISION

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) Discuss the effect of order of the median filter on the smoothing of image giving example.
- b) What is the advantage of multiple erosions with the same structure element followed by same number of dilations?
- c) How does the Signal-Noise Ratio (SNR) relate to the number of bits in the digital representation?
- d) Draw the flow chart of Canny edge detector.
- e) What are the requirements for multiresolution analysis with respect to the scaling function?
- f) Write the sequence of steps to encode pixels using Huffman coding. Which type of redundancy is exploited in Huffman coding for image compression?
- g) Explain briefly how a colored image can be represented using 8 bits.

(7x4)

2.

- a) The compass gradient operators of size 3 X 3 are designed to measure gradients of edges oriented in eight directions: E, NE, N, NW, W, SW, and S AND SE.
 - i) Give the form of these eight operators using coefficients valued 0, 1, or -1.
 - ii) Specify the gradient vector direction of each mask, keeping in mind that the gradient direction is orthogonal to the edge direction.
- b) What is Conservative smoothing ? How it works?
- c) Discuss the advantage(s) of using conservative filtering over median filtering?

(6+6+6)

3.

- a) In the table below you see an example of a three-symbol source with their initial codes stored in the dictionary.

Symbol	Code
A	1
B	2
C	3

- i) Determine the codeword assigned to **ABA** if the symbol sequence **ABABBABCABABBA** is encoded using LZW coding.
 - ii) Write the algorithm for decoder of LZW.
 - iii) Compare the compression achieved using LZW and Huffman coding assuming that ASCII code requires 8 bit for representation.
- b) Is JPEG lossless or lossy? Discuss the advantage(s) of progressive JPEG.

(12+6)

4.

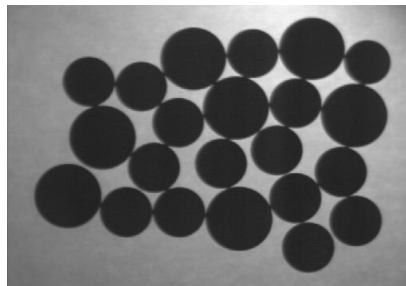
- a) What do you mean by Gaussian Averaging Filter?
- b) Explain the working of minimum mean square error filter.
- c) What are the values in the yellow boxes when 3X3 median filtering is used?

1	2	2	2	3
2	5	2	4	3
2	2	2	2	3
4	3	7	5	3
3	3	3	1	1

(6+6+6)

5.

- a) Compare erosion with opening morphological operation.
- b) Given a grey level image shown below. The image shows a number of dark disks (coins in fact) silhouetted against a light background. Propose a strategy to separate the touching objects such that the coins can be counted using labeling algorithm.



- c) How the boundaries of an object can be represented using chain code?

(4+7+7)

6.

- a) How you can detect the edges using first and second order derivatives?
- b) What does Chromaticity diagram represent?
- c) What kind of color model is the most suitable one to describe human vision? Why?

(9+3+6)

7.

- a) What is m-adjacency? What are the different neighbours of a pixel in a 2-D image?
- b) What is the drawback of an ideal low pass filter? How the drawbacks can be removed?
- c) What is a projection matrix? Compare orthographic and perspective projection.

(6+6+6)