Duration: 3hrs [Max Marks: 80]

- N.B.: (1) Question No 1 is Compulsory.
  - (2) Attempt any three questions out of the remaining five.
  - (3) All questions carry equal marks.
  - (4) Assume suitable data, if required, and state it clearly.
- 1 Attempt any FOUR.

[20]

a Perform bit-plane slicing on the following image.

$$I = \begin{bmatrix} 12 & 14 & 9 \\ 7 & 11 & 10 \\ 5 & 6 & 8 \end{bmatrix}$$

Reconstruct the image after discarding the LSB plane.

- **b** State the basic steps in frequency domain filtering.
- c Define morphological erosion and dilation of a binary image.
- **d** State the principle of basic global thresholding.
- e Compute the co-occurrence matrix  $C_{1,0}$  of the following image. (One pixel to the right)

$$I = \begin{bmatrix} 3 & 1 & 1 & 0 & 1 \\ 0 & 1 & 2 & 2 & 1 \\ 1 & 0 & 1 & 2 & 1 \\ 3 & 1 & 3 & 1 & 3 \\ 0 & 1 & 1 & 3 & 1 \end{bmatrix}$$

- 2 a Explain the working of the following sharpening spatial domain filters. [10]
  - The Laplacian
  - Unsharp masking
  - High boost filtering
  - **b** Perform Histogram Equalization for the following image. Show the original and equalized histogram. [10]

Intensity	0		2	3	4	5	6	7
No. of	70	100	40	60	10	70	10	40
pixels	35			7				

3 a Write an expression for a two-dimensional DCT. Form a 4x4 DCT matrix and compute the DCT of the following sub-image. [10]

$$I = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \end{bmatrix}$$

- b Compare Ideal, Butterworth and Gaussian Low Pass Filtering in frequency domain. [10]
- 4 a Perform segmentation using split-and-merge technique on the following image. [10]
  Show the quad-tree representation.

6	5	6	6	7	7	6	6
6	7	6	7	5	5	4	7
6	6	4	4	3	2	5	6
5	4	5	4	2	3	4	6
0	3	2	3	3	2	4	7
0	0	0	0	2	2	5	6
1	1	0	1	0	m	4	4
1	0	1	0	2	3	5	4

**b** Explain morphological region filling.

[10]

5 a Explain the working of Canny edge detector.

[10]

**b** Find the chain code and shape number of the following shape.

[10]

	1	2	3	4	5	6	7	8	
1	start	4							
	poin	t							
3									
4									
5									
6									
7									
8									

- 6 a Illustrate K-means algorithm for classification of data with a suitable example. [10]
  - **b** Explain the Support Vector Machine classifier for binary classification. [10]

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