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   Specify formulas for computing Euclidian distance, City-block distance and Chess-board distance in digital images. Draw the locus of each them.

   b   Justify/contradict: Salt-pepper noise in a digital image can be better removed by a median filter rather than an averaging filter.

   c   State what is the cause of the 'Ringing effect' when a digital image is filtered in frequency domain. How can the effect be minimized?

   d   Explain with a diagram what are support vectors in a SVM. Do they affect the classification process? If yes, how?

   e   Illustrate with an example what is grey level co-occurrence matrix in texture analysis.

2   a   Given a grey scale image as follows: **[10]**

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

      i.   Draw Histogram of the image.
      ii.   Perform histogram equalization on the image.
      iii.   Draw transformation function.
      iv.   Draw output image histogram.

   b   Describe the Canny Edge Detection method step-by-step. Support your answer with appropriate diagrams.   **[10]**

3 a For the 2x2 transform matrix [10]

$A = \frac{1}{\sqrt{2}}\begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix}$ and a sub-image $U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ compute the image transform and the basis images.

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

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

4 a Explain the Hit-and-Miss transform in Morphology. Explain how morphology can be used [10] for boundary detection.

   b Differentiate between shape and region descriptors. State their examples. Explain [10] signatures in detail.

5 a For the given image, perform region based segmentation by split and merge technique. [10] Illustrate the splitting technique with a quad tree graph. Use the Predicate P>=10 for splitting and merging.

13	12	13	12	11	12	11	12
13	13	63	63	61	11	12	11
11	12	63	62	61	62	12	12
13	13	62	63	62	61	13	13
12	11	62	63	62	11	12	11
62	62	63	61	61	62	13	13
62	61	61	62	13	12	13	11
61	62	63	11	12	11	12	12

   b Explain smoothening and sharpening filters in frequency domain. [10]

6 a Explain the need of good classifiers in object recognition. List different classifiers. [10] Explain the Bayesian classifier in detail.
   b Explain the K-means clustering algorithm with a suitable example. [10]

****

567ED5B2149E1166C0258390CBDA21BE