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 For given 5x5 image compute the De, D4, D8 distances between pixels p and q.
Let V be the set of gray levels to define the similarity criteria, where V = {2, 3}

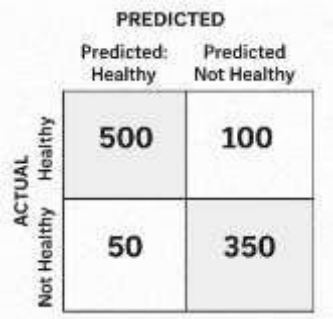
1	2	1	2	3 (q)
3	1	0	3	1
2	3	2	0	2
0	3	2	2	3
2 (p)	1	3	2	3

b Compare filtering in frequency domain versus filtering in spatial domain.

c Explain the role of illumination and reflectance in image segmentation using global thresholding.

d Explain the terms: Hyperplane, Support vectors, Margin and Kernel function in relation to support vector machine (SVM).

e Calculate accuracy, precision, recall and F1-score for the binary classification model performance shown below.



2 a What are different point-processing techniques for enhancement? Explain Contrast Stretching in detail. [10]

b Derive Haar transform matrix for N=4. Also draw the basis Haar basis functions for the same. [10]

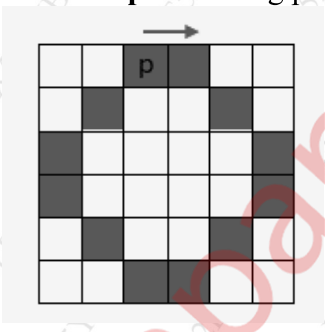
3 a Equalize the given histogram. Draw input and equalized histogram. [10]

What will be the result of histogram equalization on input image?

Grey level	0	1	2	3	4	5	6	7
No. of pixels	100	80	10	10	0	0	0	0

b Explain the following morphological operations. [10]
a) Opening and Closing
b) Hit or Miss Transform

4 a What are the chain codes? Obtain 8 directional chain code and shape factor for the boundary shown below. Consider **p** as starting point. [10]



b What is the principle of image segmentation based on similarity? [10]
Explain split and merge algorithm.

5 a Explain the significance of Gray Level Co-occurrence Matrix (GLCM) in texture analysis. [10]

Find GLCM matrix for the following image with direction shown.

1	1	2	3	3
3	1	3	4	4
2	3	4	2	3
1	2	3	1	3
3	4	2	2	3

b Explain canny edge detection algorithm step by step. What are the advantages of canny edge detection over Prewitt and Sobel. [10]

6 a What are shape descriptors? Explain how Fourier descriptors are used for boundary detection. [10]

b Explain K-means clustering algorithm using a suitable example. [10]

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