Duration: 3 hrs **[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 Explain Butterworth frequency domain filtering. **5**

b List edge models and explain any one in short. **5**

c For the following 2 images perform 1) P1 = A*B and 2) P2= max(A , B) while Result = P1 - P2 which is a 4-bit unsigned image. **5**

A=

2	3	3
3	4	18
4	3	8

B=

2	5	8
3	2	3
5	2	1

d True or False: Second order filter is better than first order filter in edge detection. Justify. **5**

e With example explain Distance measures.

2 a Explain Canny edge detection algorithm in detail steps with proper diagrams. **[10]**

b Write brief notes on any two of the following **[10]**

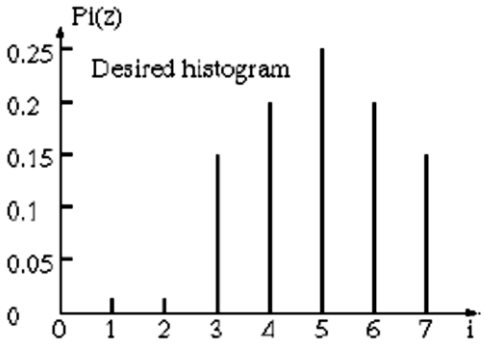
1. Thresholding
2. Fundamental steps in image processing.
3. High boost filtering

3 a Apply 3x3 averaging filter and median filter on following image. Use mirror padding. **[10]**

1	4	0	1	3	1
2	2	4	2	2	3
1	0	1	0	1	0
1	2	1	0	2	2
2	5	3	1	2	5
1	1	4	2	3	0

b A 3-bit 64x64 image with 8 intensities is described in following table. Perform histogram equalization for it. The desired histogram is shown in figure below. **[10]**

Level	0	1	2	3	4	5	6	7
Intensity	790	1024	850	656	329	245	122	81



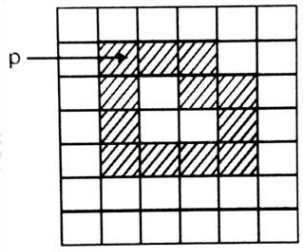
Desired Histogram

4 a Explain Hit and Miss transform with example. **[10]**

b Elaborate on the following (5 marks each) **[10]**

1. Log transformation
2. Co-occurrence Matrix

5 a Find the Chain code, Shape no., and first difference for the following image using 4 connectivity. Arrow indicates starting point. **[10]**



b Generate Haar Basis for N=4. **[10]**

6 a Describe the k-means algorithm with proper diagrams. Explain all the steps. **[10]**

b Explain region growing algorithm with proper example. **[10]**
