POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Semester: Spring
Course: Image Processing and Pattern Recognition (New)

Year : 2025
Full Marks : 100
Pass Marks : 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define sampling and quantization in image acquisition. How adjacency of the pixels affects connectivity and path between the pixels? Explain with suitable examples. 8

   b) List the basic gray level transformation technique. Perform the contrast stretching on the image given below. 7

Gray level	0	1	2	3	4	5	6	7
Frequency	0	40	60	80	50	90	10	0

2. a) What is histograms equalization? Perform the histogram equalization on the following 8-bit gray level image. 8

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

OR

A grayscale image has poor contrast. Describe how histogram equalization improves the image quality. Illustrate with a sample histogram transformation.

   b) Explain different noise models in an image with the graphs and their PDF. 7

3. a) Define DFT Transform with its expressions? List out its properties and uses. 8

OR

Derive the Kernel for Haar transform of N=2 order.

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

b) Define thresholding. How can we select the efficient threshold value for image segmentation? Mention limitations of single valued thresholding for global thresholding? How adaptive thresholding solve this issue? Explain. 7

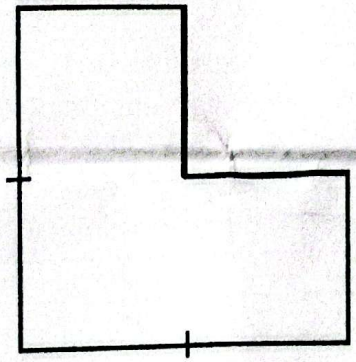
4. a) Define Image Compression. Explain Lossless predictive coding with necessary diagram. 8

b) What is edge detection? Explain the edge detection operators with mask. 7

5. a) Explain Huffman coding. Determine Huffman code for given image data and calculate the efficiency. 8

Gray Levels	0	1	2	3	4	5	6	7
Frequency	7	13	23	44	58	28	16	11

b) Define shape number. How does the order of a descriptor determine the efficiency of shape representation? Demonstrate that shape numbers are origin-invariant with the help of given shape. 7



6. a) Define pattern and pattern recognition system. explain the steps use in pattern recognition. 8

b) How SIFT keypoints can be used for feature extraction and classification? Explain. 7

7. Write short notes on: (**Any two**) 2×5

a) Discrete cosine transform

b) Image degradation/restoration model

c) Hopfield Network