Aloysius Institute of Management and Information Technology (AIMIT)
St. Aloysius College (Autonomous)
Mangalore

Paper: PS 604.2 [E2]: IMAGE PROCESSING AND PATTERN RECOGNITION

QUESTION BANK

	UNIT I	
1.	What is meant by Digital Image Processing? Explain how digital images can be represented?	10
2.	Discuss the different components of Digital Image Processing with a diagram.	10
3.	Illustrate the fundamental steps in Digital Image Processing with a diagram.	10
4.	"In the field of Digital Image Processing human intuition and analysis play a central role in the choice of one technique versus another". Justify this statement.	10
5.	Explain the process of image acquisition. Illustrate with example.	10
6.	Explain the concepts of image sampling and quantization.	10
7.	Write a short note on Image interpolation.	5
8.	Discuss some of the basic relationships between pixels in a digital image.	10
9.	Choose some examples of fields that use Digital Image Processing.	10
10.	Write short notes on the following: a. X-Ray Imaging b. Gamm Ray Imaging	10
11.	Write short notes on the following: a. Imaging in the microwave band b. Imaging in the Ultraviolet band	10
12.	Write short notes on the following: a. Adjacency b. Connectivity c. Regions d. Boundaries	20
13.	Discuss some of the distance measures used between pixels in a digital image.	10
14.	Describe the concept of linearity and nonlinearity in an image processing method with examples.	10
15.	Justify the following statement: a. H, a sum operator is linear. b. H, a max operator which is a function to find the maximum value of the pixels in an image is nonlinear	10
	UNIT II	
1.	Explain the types of gray level transformation used for image enhancement.	10
2.	"Histogram are the basis for numerous spatial domain processing techniques." Justify the statement.	10
3.	Briefly discuss the different types of processing in an Histogram.	10

4.	Discuss the concept of Correlation and Convolution in linear spatial filtering with an example.	10
5.	Discuss the image smoothing filter with its model in the spatial domain. Also explain its significance in digital image processing.	10
6.	Explain the basic steps of filtering in frequency domain with a diagram.	10
7.	Discuss the various image sharpening filters present in frequency domain.	10
8.	Discuss the various image smoothing filters present in frequency domain.	10
9.	Explain the usage of Homomorphic filtering in frequency domain.	10
10.	Explain image degradation /restoration model with diagram.	6
11.	Discuss the various noise probability density functions found in image processing applications.	10
12.	Briefly discuss the noise reduction capabilities of the following spatial filters: a. Arithmetic mean filter b. Geometric mean filter c. Harmonic mean filter d. Contraharmonic mean filter	20
13.	"Periodic noise can be analyzed and filtered effectively using frequency domain techniques". Justify the statement.	10
14.	Write short notes on: a. Minimum mean square error filter b. Constrained least square filter	10
15.	Explain homogeneity property in Linear Operator. What are the advantages and what are the limitations.	10
16.	Write short notes on: a. Weiner filter b. Geometric mean filtering c. Inverse filtering	10
UNIT III		
1.	Describe the two categories of Image segmentation.	10
2.	Briefly explain the different approaches for image segmentation.	10
3.	Illustrate the segmentation methods based on points, lines and edges.	10
4.	Discuss the different edge models classified according to their intensity profiles.	10
5.	Describe any one algorithm used for edge detection.	10
6.	Define thresholding and explain the various techniques of thresholding in detail.	10
7.	Discuss the different region based image segmentation techniques.	10
8.	What is meant by edge linking? Explain edge linking using local processing	10
9.	Define image feature? How are the features classified?	10
10.	Discuss the classification of feature extraction in Image processing.	10
11.	Define Representation. Explain two types of Image representation with an example.	
12.	Explain Chain Code with an example.	8

13.	Discuss Fourier Descriptors of the boundary. What are the properties of Fourier Descriptors?	8
14.	Write short notes on Image representation: a. Using boundary descriptors b. Using regional descriptors	20
UNIT IV		
1.	Discuss the different elements of Image Analysis.	10
2.	Interpret the different components of Pattern recognition system with an example.	10
3.	Explain the design cycle of a Pattern recognition system.	10
4.	Discuss the different forms of learning with examples.	20
5.	Distinguish between the Feature selection and Feature extraction with an example.	10
6.	What are feature vectors? Explain the concept of dimensionality reduction with respect to feature vectors.	10
7.	Explain the concept of feature space with respect to machine learning.	10
8.	Discuss the concept of clustering with an example.	10
9.	Illustrate the different distance measures used in Clustering.	10
10.	Briefly explain supervised and unsupervised parameter estimation with an example.	10
11.	Briefly explain the different clustering algorithms available.	10
12.	Illustrate hierarchical clustering algorithm with an example.	10
13.	Demonstrate k-means algorithm with an example.	10
UNIT V		
1.	Explain the two-class problem in Bayes decision theory.	10
2.	Discuss the pattern classification carried out using a statistical classifier.	10
3.	Describe the different performance evaluation measures used for measuring a classifier.	10
4.	Explain the two different paradigms of Pattern recognition.	10
5.	Write short notes on the following: a. Syntactic pattern recognition b. Statistical pattern recognition	10
6.	Write short notes on the following: a. Syntactic pattern recognition b. Fuzzy pattern recognition	10
7.	Briefly explain some applications of Pattern recognition.	10
89.	Discuss Fuzzy classification with an example.	10
9.	Discuss the concept of Fuzzy clustering. Illustrate the same with an example.	10
10.	Discuss how pattern recognition is applied in various research areas.	10
11.	Describe any one application of Pattern recognition in detail.	10

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Model question paper

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Answer **FIVE** full questions; **ONE** Full Question from every **Section**

Section I

1. a) Explain about image sampling and quantization process. 10

   b) What are the fundamental steps in Digital Image Processing? 10

2. a) Explain the process of image acquisition. Illustrate with example. 10

   b) Discuss some of the distance measures used between pixels in a digital image. 10

Section II

3. a) Explain the types of gray level transformation used for image enhancement. 10

   b) Discuss the various image smoothing filters present in frequency domain. 10

4. a) What is the use of wiener filter and least means square filter in image restoration? Explain. 10
   b) Discuss the various noise probability density functions found in image processing applications. 10

Section III

5. a) Discuss the different edge models classified according to their intensity profiles. 10
   b) Define thresholding and explain the various techniques of thresholding in detail. 10

6. a) Write short notes on Image representation: 20
      a. Using boundary descriptors
      b. Using regional descriptors

Section IV

7. a) Interpret the different components of Pattern recognition system with an example. 10

   b) What are feature vectors? Explain the concept of dimensionality reduction with respect to feature vectors. 10

8. a) Demonstrate k-means algorithm with an example. 10

b) Distinguish between the Feature selection and Feature extraction with an example. 10

Section V

9. a) Describe the different performance evaluation measures used for measuring a classifier. 10

b) Write short notes on the following: 10
   a. Syntactic pattern recognition
   b. Statistical pattern recognition

10. a) Discuss the pattern classification carried out using a statistical classifier. 10

b) Explain the two different paradigms of Pattern recognition. 10