

**B. TECH. (COMPUTER SCIENCE & BUSINESS SYSTEMS) (CBCS - 2018 COURSE)**  
**B.Tech. (CSBS) Sem - VIII : SUMMER : 2024**  
**SUBJECT: IMAGE PROCESSING & PATTERN RECOGNITION**

Day : Wednesday  
Date : 05/06/2024

**S-20497-2024**

Time : 02:30 PM-05:30 PM  
Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable calculator is allowed.

Q.1 What do you mean by convolution? Explain all the properties of convolution. (10)

**OR**

Q.1 Perform opening and closing operations on the given image. (10)

0	0	0	0	0
0	1	1	1	0
0	1	1	1	0
0	1	1	1	0
0	0	0	0	0

0	1	0
1	1	1
0	1	0

Q.2 Discuss in brief image segmentation. Write its use in image processing. (10)

**OR**

Q.2 What is the importance of image enhancement in image processing? Explain in brief any two-point processing techniques implemented in image processing. (10)

Q.3 Explain in brief iterative method of image restoration. (10)

**OR**

Q.3 Compare supervised, unsupervised and reinforcement learning techniques. (10)

Q.4 Explain Hidden Markov Model and its role in the classifier design. (10)

**OR**

Q.4 Prove that a Bayes classifier is equivalent to a minimum distance classifier, assuming that the feature vector is Gaussian. (10)

Q.5 Differentiate the following things Expectation Maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models. (10)

**OR**

Q.5 Classify the three types of HMM variants in detail. (10)

Q.6 Describe the design principles of pattern recognition system with an example. (10)

**OR**

Q.6 Explain Bayes decision rule. Explain how it can be used for two-class classification. (10)