

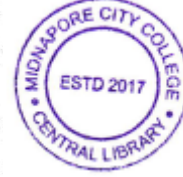
2025

5th Semester Examination (CCFUP : NEP)

BCA

Paper : BCAHMJE 1-T

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.*



(Artificial Neural Networks)

Full Marks : 60

Time : Three Hours

Group - A

Answer any *ten* questions :  $2 \times 10 = 20$

1. Define Artificial Neural network (ANN).
2. What is a Biological Neuron?
3. Write the mathematical model of McCulloch-Pitts neuron.
4. Define activation function.
5. Name two types of activation functions.
6. What is supervised learning?
7. What is unsupervised learning?
8. State the perceptron learning rule.

P.T.O.

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- 9. What is ADALINE?
- 10. Define Backpropagation.
- 11. What is an Associative Memory network?
- 12. Define Hopfield Network.
- 13. What is a Fuzzy Set?
- 14. Define membership function.
- 15. Why is single-layer perceptron used?

**Group - B**

Answer any *four* questions :  $5 \times 4 = 20$

- 16. Explain the characteristics and applications of ANN.
- 17. Describe different types of activation functions with examples.
- 18. Explain the Perceptron training algorithm with suitable example.
- 19. Discuss ADALINE and MADALINE networks.
- 20. Determine the neural representation of NAND logic gates using perception rule.
- 21. Describe classical sets and fuzzy sets with suitable examples.

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**Group - C**

Answer any *two* questions.  $10 \times 2 = 20$

- 22. (a) Explain ANN architectures and classification taxonomy in detail.
- (b) Discuss different learning strategies with examples.  $5+5$
- 23. Describe the Backpropagation algorithm in detail. Derive the weight update rule and explain input, hidden and output layer computations.  $5+5$
- 24. Explain Associative Memory Networks. Discuss Auto-associative memory and Hopfield Network with algorithm and applications.  $5+5$
- 25. (a) Explain fuzzy set operations and properties.  $5+5$
- (b) Discuss fuzzification, rule base development, decision-making system and various defuzzification methods.  $5+5$





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OR

(Image Processing)

Full Marks : 40

Time : Two Hours

Group - A

Answer any *five* questions :

2×5=10

1. State Sobel and Prewitt operators.
2. What is morphological image processing?
3. What are different edge detectors? Write their names.
4. Explain sampling and quantization with an example.
5. What is histogram of an image?
6. What is thresholding?
7. Define a digital image. What is meant by pixel?
8. What are 4-neighbourhood and 8-neighbourhood pixels?

Group - B

Answer any *four* questions :

5×4=20

9. What do you mean by image enhancement? Explain any two types of image enhancement techniques.
10. Compare between high-pass filter and low-pass filter in frequency domain.
11. Explain the different types of components of an image processing system with the help of a suitable diagram.

VN-5/304 - 800

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12. Explain image restoration framework and noise restoration filters.
13. Show how scaling and rotation are performed using transformation matrices.
14. Describe contrast stretching and histogram equalization techniques.

Group - C

Answer any *one* question :

10×1=10

15. Define and explain the effect of the following morphological processing :
  - (i) Dilation
  - (ii) Erosion
  - (iii) Opening
  - (iv) Closing
16. Discuss boundary-based and region-based segmentation techniques with suitable diagram.



P.T.O.

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OR

**(Pattern Recognition)**

Full Marks : 40

Time : Two Hours

**Group - A**

Answer any *five* questions : 2×5=10

1. Define pattern recognition.
2. What is a decision boundary?
3. Define Maximum Likelihood Estimation (MLE).
4. What do you mean by syntactic pattern recognition?
5. Distinguish between feature selection and feature extraction.
6. What is the role of activation function in a neural network?
7. Differentiate between Classification and Regression.
8. Explain the term 'intra-cluster similarity' and 'inter-cluster dissimilarity'.

**Group - B**

Answer any *four* questions : 5×4=20

9. Explain the step-by-step procedure of the K-means algorithm.
10. Explain the architecture of a Self-Organizing Map.

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11. Describe the Forward algorithm in HMM.
12. Compare statistical, structural, and signal-based feature extraction techniques.
13. Compare PCA and LDA in terms of data separability.
14. Discuss the basic concept of SVM classifier algorithm.

**Group - C**

Answer any *one* question : 10×1=10

15. Define non-parametric density estimation. Compare parametric and non-parametric methods. Explain KNN classification algorithm. 2+2+6
16. What is a feature in pattern recognition? Differentiate between pattern recognition and machine learning. Explain pattern recognition applications in healthcare, finance and fraud detection. 2+2+(2×3)

