

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**  
**IV B. Tech I Semester Advanced Supplementary Examinations March 2025**  
**AI APPLICATIONS TO ELECTRICAL ENGINEERING**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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**UNIT-I**

1. a) Explain the basic structure of an Artificial Neural Network (ANN). Describe its key components with suitable diagrams. [7M]  
b) What are the different types of activation functions used in neural networks? Explain their significance. [7M]

(OR)

2. a) Explain the concept of Perceptron learning with an example. What are the limitations of a single-layer perceptron? [7M]  
b) What is linear separability? Explain why a single-layer perceptron cannot solve the XOR problem. [7M]

**UNIT-II**

3. a) Describe the working of the Backpropagation algorithm with the necessary mathematical formulations. [7M]  
b) What is a Radial Basis Function (RBF) network? Compare RBF networks with Multi-Layer Perceptrons (MLP). [7M]

(OR)

4. a) Explain Kohonen's Self-Organizing Feature Map (KSOFM) and its significance in pattern recognition. [7M]  
b) Write a short note on Hopfield Neural Networks. How do they function as associative memories? [7M]

**UNIT-III**

5. a) Differentiate between classical sets and fuzzy sets with suitable examples. [7M]  
b) Explain the properties of fuzzy sets and fuzzy relations. Provide real-world examples. [7M]

(OR)

6. a) Define a membership function in fuzzy logic. Explain different types of membership functions with graphs. [7M]  
b) Discuss fuzzy operations and their applications in decision-making processes. [7M]

**UNIT-IV**

7. a) Explain the process of fuzzification and the different methods of membership value assignment. [7M]  
b) How is a rule base developed in a fuzzy logic system? Illustrate with an example? [7M]

(OR)

8. a) What is defuzzification? Explain different defuzzification methods with examples. [7M]  
b) Discuss the structure of a fuzzy inference system and its role in decision-making. [7M]

**UNIT-V**

9. a) Explain the application of neural networks in load flow studies. How does ANN improve power system performance? [7M]  
b) Discuss the role of neural networks in reactive power control. [7M]

(OR)

10. a) How is fuzzy logic used in economic load dispatch? Explain with a suitable case study. [7M]  
b) Explain the application of fuzzy logic in the speed control of DC motors. [7M]

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