

1T01036 - T.E.(Electronics and Telecommunication)(SEM-VI)(Choice Base Credit Grading System) (R-20-21) (C Scheme) / 89344 - Artificial Neural Network and Fuzzy Logic
QP CODE: 10028324 DATE: 16/05/2023.

(3 Hours)

Total Marks: 80

- N.B. : (1) Questions No.1 is compulsory.
(2) Solve any **three** questions out of **remaining**
(3) Draw neat labeled diagram whenever necessary
(4) Assume suitable data if necessary

- Q1. **Answer any 4 questions:**
- a. Brief with suitable diagram the feature map extraction process of convolutional neural network for image recognition. 5
 - b. Prove De-Morgan's theorem If X and Y are two fuzzy sets with membership functions: $\mu_x = \{0.3, 0.7, 0.2, 0.4\}$ $\mu_y = \{0.1, 0.4, 0.8, 0.3\}$. 5
 - c. Discuss competitive learning with a flow chart. 5
 - d. Brief about supervised and unsupervised learning? Give their examples 5
 - e. Explain cross validation error based stopping criteria used in neural network training. 5
- Q2.a. What are activation functions in neural networks? What are their properties? Draw any four activation functions with their mathematical equations. 10
- b. Explain the working of K-Means clustering algorithm with flowchart. 10
- Q3.a. Explain with a flow chart the error backpropagation learning algorithm. 10
- b. Explain a Mamdani fuzzy controller for deciding the wash time in a washing machine. Consider inputs as washing load and dirt. Use any suitable membership functions with three descriptors for input and output. 10
- Q4.a. What is De-fuzzification? Discuss any two methods of De-fuzzification. 10
- b. Implement AND function using perceptron network. Consider bipolar inputs and targets, initial bias and weights as 0 and the learning rate as 1. 10
- Q5.a. With a flow chart explain the gradient descent algorithm. 10
- b. Define the terms support vectors and hyperplane with reference to a support vector machine. How do support vector machines differ from conventional classifiers? What are the advantages and limitations of SVMs? 10
- Q6.a. What is the difference between machine learning and deep learning? Draw and explain the architecture of Convolution Neural Network. Discuss its applications. 10
- b. Construct a discrete Hopfield network to store the patterns $S_1 = [1 -1 1 -1]$ and $S_2 = [-1 1 -1 1]$. If the received pattern is $[1 1 -1 1]$, identify the correct pattern. 10