Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCS7D007

7th Semester Regular/Back Examination: 2025-26
SUBJECT: SOFT COMPUTING
BRANCH(S): AEIE, BIOMED, CIVIL, ECE, EEE, ELECTRICAL, ENV, ETC, MECH, MINING, PT
Time: 3 Hours
Max Marks: 100
Q.Code: U312
Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define fuzzy set and crisp set with examples.
b) What is Zadeh's compositional rule of inference?
c) Define membership function and its types.
d) What is an activation function? Give two examples.
e) Define a perceptron and mention its limitations.
f) What is the purpose of the error backpropagation algorithm?
g) Differentiate between supervised and unsupervised learning.
h) What is a fitness function in GA?
i) Define crossover and mutation.
j) Differentiate between GA and traditional optimization techniques.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Compare and contrast Mamdani and Takagi–Sugeno fuzzy systems with examples.
b) Discuss in detail the steps involved in fuzzy inference using the Mamdani architecture.
c) Derive and explain basic set operations for fuzzy sets with diagrams.
d) Write short notes on fuzzy rule base and fuzzy inference mechanisms.
e) Explain Kohonen's Self-Organizing Map and its learning process.
f) Discuss how recurrent neural networks differ from feedforward neural networks.
g) Compare the performance of RBF and MLP networks for pattern classification.
h) Describe the working of the Adaline model and derive the weight update rule.
i) Discuss the different encoding schemes used in GAs.
j) Explain how hybrid evolutionary algorithms improve search efficiency.
k) Write short notes on elitism and its impact on GA performance.
l) Discuss the convergence behavior of GA in solving optimization problems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Derive and explain the complete fuzzy control architecture for an automatic braking system in a car.	**(16)**
Q4	Design an ANFIS-based predictive model for rainfall forecasting, explaining data flow, fuzzy rule formation, and hybrid training.	**(16)**
Q5	Compare and analyze the performance of GA, evolutionary programming, and differential evolution in solving multimodal optimization problems.	**(16)**
Q6	Develop a hybrid GA–neural network model for optimizing classification accuracy in a pattern recognition problem.	**(16)**