

Exam.Code:1000
Sub. Code: 34993

2056
M.E. (Computer Science and Engineering)
Second Semester
CS-8203: Soft Computing

(Common with ME Comp. Sci. Cyber Security CSN 8202)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

Section-A

- Q1. a) How does the backpropagation algorithm minimize error in neural networks? 10
b) Why are Self-Organizing Maps useful for clustering and visualization?
c) What is the role of Boltzmann machines in learning complex patterns?
d) What is the function of membership functions in fuzzy logic systems?
e) A chromosome has a fitness value of 20 and the total population fitness is 100. Calculate the selection probability of the chromosome.

Section-B

- Q2. a) A neuron receives inputs $x_1=1$, $x_2=-1$, $x_3=2$ with weights $w_1=0.2$, $w_2=0.5$, $w_3=-0.4$. Calculate the net input of the neuron. 5
b) Define Artificial Intelligence. How does Artificial Intelligence help in predictive analysis for business decisions? 5
Q3. a) In a neural network, several neurons compete to respond to an input, but only one neuron becomes active and updates its weight. Explain the concept of competitive learning and its purpose. 5
b) Draw the architecture of Kohonen Self-Organizing Map (SOM) and explain its learning mechanism. 5
Q4. a) Write short note on Hopfield Neural networks. 5
b) A company wants to group customers based on shopping behavior without predefined labels. Which neural network technique can be used for clustering? Explain briefly. 5

Section-C

- Q5. a) How is the Energy Function defined in a Boltzmann Machine, and which state of the network represents the learned representation of the input data? 5
b) A Radial Basis Function (RBF) network is a type of feed-forward neural network that uses radial basis functions as activation functions. Why is RBF training faster than Backpropagation? 5

P.T.O.

(2)

Q6. a) Two fuzzy sets A and B defined on a universe $U = \{10, 20, 30\}$:

- $A = \{10/0.2, 20/0.5, 30/0.8\}$
- $B = \{10/0.4, 20/0.3, 30/1.0\}$

Find the Union ($A \cup B$) and the Intersection ($A \cap B$) of these sets.

b) Explain the difference between Mamdani and Sugeno fuzzy inference systems. Which one would you use for a system requiring a precise mathematical output?

Q7. a) A smart grid system needs to select which 3 power plants out of 10 available should be active to meet a specific load with minimum cost. Define a binary chromosome for this problem and describe how the Fitness Computation would be structured to prioritize lower costs while meeting the load requirement.

b) Discuss the "Survival of the Fittest" principle. How is the Fitness Computation used to decide which chromosomes proceed to the next generation?

x-x-x