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Total Number of Pages : 02

B.Tech
PCP7H010

7th Semester Regular / Back Examination 2019-20

SOFT COMPUTING

BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE,
ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUFAC,
MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Max Marks : 100

Time : 3 Hours

Q.CODE : HRB258

Answer Question No.1 (Part-1) 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 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- State the laws of crisp logic which are violated by fuzzy logic?
- Define Cartesian product of two fuzzy sets with an example.
- Define Composite and non-composite MFs along with examples?
- What are the different feed forward networks used in artificial neural network?
- What are GMP and GMT?
- Describe fuzzy if then rule with an example?
- Why perceptron cannot solve non-linear problem?
- Discuss the important features of kohonen self-organizing map.
- Differentiate between derivative based and derivative free optimization?
- What is elitism in genetic algorithm?

Part- II

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

- a) Consider two fuzzy set $A = \{1/2, 0.3/4, 0.5/6, 0.2/8\}$ $B = \{0.5/2, 0.4/4, 0.1/6, 0.9/8\}$
Find the following :
- $A \cup B$
 - $A \cap B$
 - \bar{A}
 - \bar{B}
 - $\bar{A} \cap \bar{B}$
 - $\bar{A} \cup \bar{B}$
 - $\overline{A \cup B}$
 - $\overline{A \cap B}$
 - $A \cup \bar{A}$
 - $A \cap \bar{A}$
 - $B \cup \bar{B}$
 - $B \cap \bar{B}$
- b) List the differences between sugeno type and mamdani type fuzzy models?
- c) Why defuzzification is necessary. Explain the various defuzzification methods?
- d) Describe RBF network model and explain how the activation is calculated and the weights are adapted?
- e) Given two fuzzy relations R and S as follows :

$$R = \begin{bmatrix} 0.7 & 0.5 & 0 \\ 0.8 & 0.4 & 0.5 \end{bmatrix} \quad S = \begin{bmatrix} 0.9 & 0.6 & 0.2 \\ 0.1 & 0.7 & 0.5 \\ 0.5 & 1 & 0 \end{bmatrix}$$

Find $R \circ S$ using (a) max-min composition
(b) max-product composition

- f) Consider a fuzzy set A in the universe R, whose membership function is given by:
- $$\mu_A(x) = 1 - 2|x - 1| \quad \text{for } |x - 1| \leq 0.5$$
- $$= 0 \quad \text{Otherwise}$$
- Sketch the membership function
 - Find the Support of A
 - Find the $\alpha_{0.5}$ cut of A

- g) Define and discuss mathematical extension principle of a fuzzy set?
Let $A = \{(-1, 0.4) (0, 0.7) (2, 0.8) (3, 0.3)\}$. Apply the extension principle find $B = \psi(A)$, where $\psi(x) = X^2 - 2$
- h) A neuron with three input has the weight vector $w = [0.1 \ 0.2 \ -0.3]$. The activation function is binary sigmoidal. If the input vector is $[0.6 \ 0.8 \ 0.4]$, then find the output of the neuron?
- i) With the help of a suitable example, show how a multi-layer perceptron can be used to provide non-linear decision boundary in pattern classification.
- j) Using the linear separability concept, obtain the response for OR function. Take bipolar inputs and bipolar targets.
- k) Elaborate on neuro-fuzzy inference system?
- l) Explain different types of activation function used in NN?

Part-III

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

- Q3** Construct a Kohonen self-organizing map to cluster the four given vector: $[0 \ 0 \ 1 \ 1]$, $[1 \ 0 \ 0 \ 0]$, $[0 \ 1 \ 1 \ 0]$ and $[0 \ 0 \ 0 \ 1]$. The number of cluster to be formed is two. Assume an initial learning rate of 0.5. **(16)**
- Q4** Explain the working of backpropagation learning algorithm in detail with suitable diagram? **(16)**
- Q5** Construct an ANFIS that is equivalent to a two-input two-rule Mamdani fuzzy model with maxi-min composition and centroid defuzzification. Explain the function you use to approximate the centroid defuzzification. **(16)**
- Q6** Explain genetic algorithm cycle in detail with examples? **(16)**