BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Tech.(CSE)-AIML-2021
Course Name – Soft Computing
Course Code - PEC-CSM601A
(Semester VI)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Choose the term that refers to the count of elements in a set:

a) Cardinality
c) Fuzzification
b) Membership function
d) Defuzzification

(ii) Choose the term related to converting fuzzy quantities into specific, well-defined values:

a) Defuzzification
c) Crispification
b) Ambiguification
d) Vaguenessification

(iii) Interpret the property that distinguishes fuzzy sets by allowing elements to belong to multiple sets with different degrees:

a) Ambiguity
c) Overlapping
b) Clarity
d) Precision

(iv) Identify the process involved in converting a fuzzy set into a crisp value in fuzzy logic.

a) Fuzzification
c) Membership function
b) Defuzzification
d) Implication

(v) Select the fuzzy logic operator representing the logical OR operation.

a) Intersection
c) Complement
b) Union
d) Implication

(vi) Interpret the purpose of training an ANN:

a) Make predictions
c) Visualize data
b) Optimize hyperparameters
d) Perform encryption

(vii) Determine the output of a neuron if the weighted sum of inputs is below the threshold:

a) 0
c) -1
b) 1
d) Undefined

(viii) Select which of the following is a soft computing technique used for handling uncertainty and imprecision in decision making?

a) Support Vector Machines (SVM)
b) Ant Colony Optimization (ACO)

c) Fuzzy Logic   d) Dijkstra's Algorithm

(ix) Select which of the following is a characteristic of hard computing?

a) Uncertainty handling   b) Fuzzy logic
c) Deterministic algorithms   d) Genetic algorithms

(x) Select which computing paradigm is more suitable for dealing with real-world problems characterized by uncertainty and imprecision?

a) Hard computing   b) Soft computing
c) Evolutionary computing   d) Evolutionary computing

(xi) Choose the correct statement about the training process of a perceptron:

a) Perceptrons do not require a training process.
b) Perceptrons use reinforcement learning for training.
c) Perceptrons adjust their weights based on input-output pairs.
d) none of the above

(xii) Choose the correct description of the role of weights in a single layer network:

a) Weights are not used in a single layer network
b) Weights control the flow of information between neurons
c) Weights are fixed and cannot be adjusted
d) Weights are only applicable to deep neural networks

(xiii) Determine the property of fuzzy relations which represents their ability to link elements across different sets.

a) Reflexivity   b) Symmetry
c) Transitivity   d) Interconnectivity

(xiv) Choose the correct option that best describes a genetic algorithm (GA).

a) An algorithm that simulates the process of natural selection to evolve solutions to optimization problems.
b) An algorithm that uses gradient descent to find optimal solutions.
c) An algorithm that employs fuzzy logic for decision-making.
d) An algorithm that relies on neural networks for optimization.

(xv) When applying a genetic algorithm to a problem, choose the correct option when designing the representation of solutions.

a) The number of iterations.   b) The size of the population.
c) The characteristics of the problem domain.   d) The mutation rate.

Group-B
(Short Answer Type Questions)   3 x 5=15

2. Tabulate the difference between Classical set and fuzzy set.   (3)
3. Explain the principle behind Hebb's learning and its significance in neural network training.   (3)
4. Define competitive learning in neural networks. Provide an example scenario where competitive learning is advantageous.   (3)
5. Consider two set A and B defined over the universes X and Y A = {1, 2, 3, 4} and B = {3, 5, 7}   (3)
   Calculate the elements of the following relation R = {(a,b) | b=a+1, (a,b) ∈ A X B }
6. Explain about goals of rough set theory.   (3)

OR

Consider about principle of Ant Colony Optimization.   (3)

Group-C
(Long Answer Type Questions)   5 x 6=30

7. Describe the operations commonly performed on classical sets, such as union, intersection, complement, and Cartesian product, providing examples for each operation.   (5)
8. Summarize the concept of fitness function in genetic algorithms and its significance.   (5)

9. Recall Competitive learning in neural networks (5)

10. Given two fuzzy sets (5)

$$A=\left\{\frac{1}{0.1}+\frac{0.75}{1.5}+\frac{0.3}{2.0}+\frac{0.15}{2.5}+\frac{0}{3.0}\right\}$$

$$B=\left\{\frac{1}{0.1}+\frac{0.6}{1.5}+\frac{0.2}{2.0}+\frac{0.1}{2.5}+\frac{0}{3.0}\right\}$$

Calculate   1) $A \cup B$ 2) $A \cap B$ 3) A', 4) B'

11. Explain about application of Ant Colony Optimization. (5)
12. Explain the role of crossover in exploring solution space. (5)

OR

Explain the concept of hypothesis in soft computing and its significance. (5)

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