



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(CSE)-AIML-2021/B.Tech.(CSE)-AIML-2022/B.Tech.(CSE)-AIML-2023/B.Tech.(CSE)-2023

Course Name – Soft Computing

Course Code - PEC-CSM601A/PEC-CSG601A
(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
 - b) Membership function
 - c) Fuzzification
 - d) Defuzzification
- (ii) Select the technique in which algorithms learn to make decisions by maximizing rewards and minimizing penalties based on feedback from the environment.
 - a) Supervised learning
 - b) Unsupervised learning
 - c) Reinforcement learning
 - d) Deep learning
- (iii) Select the option which is not a component of soft computing techniques.
 - a) Genetic Algorithms
 - b) Simulated Annealing
 - c) Backpropagation
 - d) Binary Search
- (iv) Select the computing approach that can easily adapt to dynamic and evolving conditions.
 - a) Hard computing
 - b) Soft computing
 - c) Hybrid computing
 - d) Quantum computing
- (v) Choose the correct statement about perceptrons:
 - a) Perceptrons can only solve linearly separable problems.
 - b) Perceptrons can solve non-linear classification problems.
 - c) Perceptrons have multiple hidden layers.
 - d) Perceptrons are not used in modern machine learning.
- (vi) Choose the correct sequence of steps in backpropagation:
 - a) Forward pass, error computation, backward pass, weight update.
 - b) Backward pass, weight update, forward pass, error computation.
 - c) Error computation, backward pass, weight update, forward pass.
 - d) Forward pass, weight update, error computation, backward pass.
- (vii) Choose the appropriate statement regarding the activation function in a single layer network:

- a) It is not required in a single layer network b) It introduces non-linearity to the model
 c) It always uses the step function d) It is only applicable to deep neural networks
- (viii) Choose the cardinality of a fuzzy set with all elements having a membership of 0.5.
 a) 0 b) 0.5
 c) 1 d) Cannot be determined
- (ix) Choose the feature of membership functions that describes their ability to capture the degree of membership.
 a) Fuzziness b) Ambiguity
 c) Granularity d) Continuity
- (x) Choose the type of logic that allows for handling uncertainty and imprecision.
 a) Classical logic b) Fuzzy logic
 c) Boolean logic d) Predicate logic
- (xi) Choose the characteristic of fuzzy logic that enables handling imprecise information.
 a) Ambiguity b) Vagueness
 c) Precision d) Determinism
- (xii) Choose the correct option that is NOT a component of a genetic algorithm.
 a) Selection b) Mutation
 c) Backpropagation d) Crossover
- (xiii) Select the correct option for the fitness function in a genetic algorithm:
 a) Measures the probability of an individual being selected for reproduction. b) Quantifies how close a solution is to the optimal solution.
 c) Determines the rate of mutation in the population. d) Regulates the crossover operation.
- (xiv) Choose the correct selection method in a genetic algorithm that gives higher probability of selection to individuals with higher fitness.
 a) Tournament selection b) Roulette wheel selection
 c) Random selection d) Elitist selection
- (xv) Choose the correct purpose of the termination condition in a genetic algorithm.
 a) To determine the size of the population. b) To specify the crossover and mutation rates.
 c) To define when the algorithm should stop its execution. d) To evaluate the fitness of individuals in the population.

Group-B

(Short Answer Type Questions)

3 x 5=15

2. State any three operations on fuzzy sets. (3)
3. Prepare the operation of a Back-propagation network and its role in training multilayer perceptrons (3)
4. Tabulate the difference between computational intelligence and machine learning. (3)
5. Discuss the primary goal of soft computing. (3)
6. Explain Crossover with its purpose. (3)

OR

Explain the process of implementing Crossover with some advantages of it. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Illustrate the working principle of Swarm Intelligence with an example. (5)
8. Given two fuzzy sets: $A = \{ 1/0.1 + 0.75/1.5 + 0.3/2.0 + 0.15/2.5 + 0/3.0 \}$ $B = \{ 1/0.1 + 0.6/1.5 + 0.2/2.0 + 0.1/2.5 + 0/3.0 \}$ Evaluate: 1) $A \cup B$, 2) $A \cap B$, 3) A' , 4) B' (5)
9. Evaluate about Ant Colony Optimization principle. (5)
10. Discuss what is hard computing, and how does it differ from soft computing? (5)

11. Describe what is the significance of Moore's Law in the history of computing? (5)
12. Explain swarm intelligence. (5)

OR

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

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