**SOFT COMPUTING SUGGESTIVE QUESTIONS FOR PRACTICE**

**Short Questions**

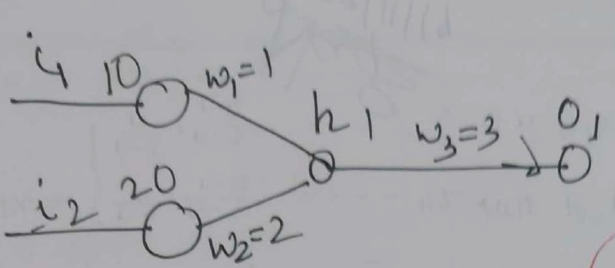
* What is hard computing?
* What is soft computing?
* What is a single solution-based search?
* What is a population-based search?
* What are iterative algorithms?
* Define greedy algorithms.
* What is MeOM in defuzzification?
* Define a fuzzy set.
* What is the significance of IF-THEN rules in Fuzzy logic representation?
* What is Crisp Set theory?
* List two common defuzzification methods.
* What are the truth values of a fuzzy set?
* How are the values of a fuzzy set membership represented?
* What are fuzzy operators?
* What is a fuzzy relational database?
* What is entropy?
* What is a fuzzy variable?
* List three popular Gradient based optimization algorithms used to minimize the loss function in machine learning models.
* Write the expression to update the weights during backpropagation in a neural net.
* List three widely used learning rules.
* What is a bias in a neural network?
* Define learning rate.
* Name the type of learning utilized in Self Organized Maps.
* What is a Perceptron?
* What is ADALINE?
* What is MADALINE?
* Recall Perceptron learning rule.
* Define Activation function.
* What is a neuron.
* What is a Uniform Crossover?
* Define mutation.
* List the general sequence for evolutionary algorithms.
* What are evolutionary algorithms?
* What is Time compression in a simulation?
* Name two problems which are not suitable for Genetic Algorithms.
* Define selection.
* Define cross mutation.
* Define reproduction.
* What is a DNA?
* What is RNA?
* Define metaheuristics.
* What is Aspiration Criterion in a Tabu search?
* What is a Metropolis function?
* What is exploitation in the context of a heuristic search?
* What is exploration in the context of a heuristic search?
* What is a design problem?
* What is a control problem?
* Name few evolutionary algorithms.
* Name a metaheuristic search technique that uses memory.

**5 marks**

* Outline the primary characteristics of Soft computing.
* Summarize the role of a membership function in Fuzzy logic.
* List three types of Activation functions in ANN with their mathematical properties.
* Illustrate the Fuzzification procedure with the help of a suitable example.
* Summarize the cardinalities in fuzzy sets.
* Summarize the membership functions in fuzzy sets.
* Compare classical sets and fuzzy sets.
* Outline some properties and operations on crisp relation.
* Outline the intuition behind Competitive Learning.
* Compare and contrast Batch Gradient Descent and Stochastic Gradient descent.
* Summarize the steps followed in a neural network backpropagation.
* Outline the intuition behind Delta Learning rule.
* Outline the intuition behind Hebbian Learning rule.
* Summarize the concept of a mutation operator with an example.
* List different cross over operations performed in Genetic Algorithm.
* Summarize the concept of selection and fitness function.
* Summarize few disadvantages of Hill Climbing algorithm.
* Illustrate the Tabu search algorithm with the help of a flowchart.
* Outline the concepts of Steepest-Ascent and Stochastic hill climbing.

**15 marks**

* Outline some attractive features of the biological neural network that make it superior to the most sophisticated Artificial Intelligence computer system for pattern recognition tasks. With the help of block diagrams, interpret i) supervised learning ii) unsupervised learning and iii) Reinforcement learning
* Derive output equations and weight update equations for a multilayer feed forward neural network applying back propagation algorithm. What are the limitations of “Perceptron” model? Explain.
* Explain the relations of classical sets. Explain air conditioner control using fuzzy logic.
* List three strengths and three weaknesses of fuzzy expert systems. Explain crisp and fuzzy implication rules.
* List the basic components of a fuzzy logic system. Explain each of them in detail. Summarize the concept of membership value assignment.
* Summarize the concept of fuzzy composition operations. Illustrate decision making using composite operations with the help of a relevant example.
* Outline the properties of a fuzzy set. Explain applications of fuzzy logic in control system with one example.
* Explain about the development of rule base. Let A=((x1,0.5),(x2,0.7),(x3,0)) and B=(x1,0.8),(x2,0.2),(x3,1) are fuzzy sets with associated membership values. Find AUB(x1), AUB(x2), AUB(x3)
* Summarize conditional fuzzy proposition and unconditional fuzzy proposition. Explain fuzzy associate memory (FAM) with a suitable example.
* Explain the backpropagation algorithm with the help of a flowchart. A feed-forward neural network with three hidden layers. Number of units in the input, first hidden, second hidden, third hidden and output layers are respectively 4, 6, 4, 4 and 2. Each of the hidden and the output layer also has an associated bias. Use the preceding data to calculate the total no. of trainable parameters in the neural net.
* Summarize the working principle of a Restricted Boltzmann Machine. Elaborate the training and reconstruction phases.
* Summarize the concept of a multi-layer perceptron. Apply backpropagation algorithm to update the weights of the neural network in the subsequent diagram. Consider the desired output to be 150 and activation function to be ReLU in the hidden and the output layer.



* Compare Genetic algorithm and traditional algorithms. Consider the problem of finding the shortest route through several cities, such that each city is visited only once and in the end return to the starting city (the Travelling Salesman problem). Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between London and Paris is represented by a single gene ‘LP’. Let also assume that the direction in which we travel is not important, so that LP = P L. a) Calculate how many genes will be used in a chromosome of each individual if the number of cities is 10? b) Write the count of genes in the alphabet of the algorithm?
* If the population size in a genetic algorithm is restricted to 1, what search algorithm does it correspond to? Explain your answer. A budget airline company operates 3 planes and employs 5 cabin crews. Only one crew can operate on any plane on a single day and each crew cannot work for more than two days in a row. The company uses all planes every day. A genetic algorithm is used to work out the best combination of crews on any particular day, Suggest i) Chromosome ii) Alphabet iii) fitness function for this problem.
* Explain how genetic algorithms work. Explain different reproduction operators used in GA.
* Construct an evolutionary algorithm for Particle Swarm Optimization. Summarize the Simulated Annealing algorithm in pseudo code.
* Compare heuristics and metaheuristics. Explain the use of recency-based memory and tabu classification in a Tabu search.
* Compare the working principle of a deterministic and stochastic metaheuristic searching algorithm. Summarize the Simulated Annealing algorithm with a flowchart.