No. of Printed Pages : **2**

Sl. No.

C9-R4 : SOFT COMPUTING

NOTE :

1. **Answer the Question number 1 which is compulsory and any four questions from Question number 2 to Question number 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Total Time : 3 Hours **Total Marks : 100**

1. (a) What are the differences between Soft computing and Hard Computing ? Explain with an example.

(b) Explain Simulated annealing algorithm.

(c) Explain mutation operator in genetic modelling with an example.

(d) Explain how to use Least square methods for System Identification.

(e) Discuss Cooperative Neuro Fuzzy approach in Genetic Modelling.

(f) What do you mean by Genetic fuzzy Neural Network ?

(g) Discuss the framework of Adaptive Neuro Fuzzy Inference System.

(7x4)

2. (a) What are the constituents of Soft computing ?

(b) What are the differences between Crisp Logic and Fuzzy Logic ?

(c) Minimise the function f(x) = x^2+4x-7 using a Genetic algorithm. Start with initial population of 6 individuals, each consisting of a binary string of length 6 representing a value of x between -10 and 10 **(5+4+9)**

3. (a) Can the inverse operator be used to improve the performance of a genetic algorithm that is stuck in a local minimum ? Why or why not ?

(b) How does the reproduction operator affect the genetic diversity of a population in a genetic algorithm ?

(c) How does the choice of mutation operator affect the performance of a genetic algorithm, and what are some factors to consider when selecting an appropriate operator ? **(6+6+6)**

4. (a) What is the purpose of convergence criteria in optimization, and how are they chosen ?

(b) How can one ensure that the solution obtained from derivative-free optimization is accurate and reliable ?

(c) What is the role of the prediction error in a recursive least square estimator ? **(6+6+6)**

5. (a) What are the most important design choices when building a neuro fuzzy model, such as the number of neurons, hidden layers, and activation functions ?

(b) How does the Cooperative Neuro-Fuzzy approach integrate fuzzy logic and neural networks ?

(c) How can the neuro-fuzzy approach be applied to speech recognition systems, and what are the benefits of using this approach over traditional methods ? **(6+6+6)**

6. (a) How does ANFIS compare to other machine learning algorithms in terms of accuracy, efficiency, and interpretability ?

(b) What are the different methods for rule extraction in ANFIS ?

(c) How does the choice of reward function impact the learning process in a neuro-fuzzy control system with reinforcement learning ? **(6+6+6)**

7. (a) What is the concept of inverse learning in neuro-fuzzy control systems ?

(b) How do evolving neural networks differ from traditional, non-evolving neural networks ?

(c) Can fuzzy evolutionary systems be used for both classification and regression Problems ? **(6+6+6)**

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