

**C9-R4 : SOFT COMPUTING****NOTE :**

1. Answer question 1 and any FOUR from the questions 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

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

1.
  - (a) Explain the basic concept of Hill Climbing.
  - (b) Elucidate the importance of population size with reference to Genetic Algorithm. Which operator is applied first to the population ? How the cross-over rate is calculated in Genetic Algorithm ?
  - (c) Discuss the common characteristics of Derivative Free Optimization methods.
  - (d) Write about the significance of Genetic Algorithm in present scenario.
  - (e) Define the following terms : Crisp Logic, Fuzzy Logic and Rough Logic.
  - (f) Enumerate the advantages of Neuro-Fuzzy approach.
  - (g) Explain Reinforced learning. (7x4)
2.
  - (a) Why Back-Propagation (BP) algorithm is often used for training Neural Networks ? Why do we need to calculate the gradient in the BP algorithm ?
  - (b) Explain following Soft Computing (Hybridization) Techniques with their significance and applications :
    - (i) Co-operative Neuro-Fuzzy approach
    - (ii) Concurrent Neuro-Fuzzy approach
  - (c) Elucidate the main purpose of System Identification. Discuss the two top-down steps required by the System Identification. (6+6+6)
3.
  - (a) "Fuzzy Logic and Neural Networks are complementary tools in building intelligent systems". Do you agree with the statement ? Justify your answer. Explain the structure of Neuro-Fuzzy Systems.
  - (b) Give detailed description of three main operators of Genetic Algorithm (GA). Draw flow chart of Genetic algorithm.
  - (c) An 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.
    - (i) Suggest what chromosome could represent an individual in this algorithm.
    - (ii) Suggest a fitness function for this problem.
    - (iii) How many solutions are possible in this problem ? Is it necessary to use Genetic Algorithms for solving it ? (6+6+6)

4. (a) Elucidate the two phases of Inverse Learning for the designing of Neuro-Fuzzy Controllers. "Specialized Learning overcomes the disadvantages of Inverse Learning". Justify your answer.  
(b) What is the motivation behind Reinforcement Learning ? How does Reinforcement Learning works ? (9+9)
5. (a) Explain Least Square methods for system identification. How least square estimates are chosen ?  
(b) What are the characteristics of Derivative Based Optimization methods ? List the techniques that are covered under Derivative Based Optimization methods and describe any one technique in detail. (9+9)
6. (a) Explain the Genetic-Fuzzy Rule Base System.  
(b) Give the advantages of augmenting Neuro-Fuzzy Systems with additional genetic or evolutionary learning capabilities into so called Genetic-Neuro-Fuzzy Systems or Genetic Fuzzy Neural Networks. Explain any one application of Genetic-Neuro-Fuzzy Systems in detail. (9+9)
7. (a) What does ANFIS stand for ? Draw two-input first order Sugeno model and its equivalent ANFIS architecture. Explain the layers of ANFIS architecture in detail. Enumerate advantages and disadvantages of ANFIS. Describe in detail any one application where ANFIS is used.  
(b) Explain Neuro Genetic system. List its applications also. (12+6)

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