Ref. No. : Ex/PG/IEE/T/114A/2024

M. Tech. IEE 1st Year, 1st Semester Examination, 2024

Soft-Computing – Theory and Applications

Time : 3 Hours **Full Marks : 100**

*Answer any **Five** questions*

1. a) How is soft-computing different from hard-computing? 3
   b) Crisp set is a special case of fuzzy set – Justify. 4
   c) What is a convex fuzzy set? What are meant by dilation and concentration of a fuzzy set? 2+3
   d) Define the various forms of parametric membership functions usually used in fuzzy decision making systems. 8

2. a) Explain with examples the union and intersection operations of i) fuzzy sets and ii) two binary fuzzy relations. 4+6
   b) Providing the block diagram of a simple fuzzy logic controller, explain the role of its various computational blocks. 10

3. a) Mention and draw the various structures of Neural Networks. 4
   b) In the context of neural networks what is meant by learning? Discuss about the various learning methods of neural networks. 2+10
   c) Learning rate parameter plays an important role for the convergence of the Back-propagation algorithm – Explain. 4

4. a) Describe the three essential computational steps involved in the formation of the self-organizing map for the Kohonen model. 15
   b) Give an idea how SOM can be used in designing a fuzzy model for an unknown plant from its input-output data. 5

5. a) How Genetic algorithms (GA) differ from conventional optimization techniques? 4
   b) Clearly explain the genetic operations involved in a simple GA (SGA). 12
   c) How GA can be used in designing an optimal fuzzy controller. 4

6. Write short notes on : 10+10
   a) Back-propagation algorithm to derive the update equation for the synaptic weights of a Multi-layer Feedforward networks.
   b) Neural-network model for fuzzy control and decision making systems.