MASTER OF COMPUTER SCIENCE & ENGINEERING EXAMINATION 2017

(2nd Semester)

SOFT COMPUTING

Time: Three Hours   Full Marks: 100

Answer any Five Questions

1. a) Write down the expected characteristics of Real World Computing.   (4)
    b) Compare Hard Computing and Soft Computing.   (4)
    c) Discuss on the usefulness of each of the major components of Soft Computing.   (8)
    d) Justify ----"von Neumann machine is far behind human beings while solving real life problems".   (4)

2. a) What characteristics of an Artificial Neural Network (ANN) make it a suitable tool for learning?   (4)
    b) What is a Perceptron? Discuss on the Delta Rule of Learning for a single layer Perceptron.   (2+4)
    c) What are the roles of activation function in ANN? Discuss on different types of activation functions used in ANN and their usage.   (4+6)

3. a) What is Multi Layer Perceptron (MLP)? How do you set the number of nodes in each layer of MLP? Why do not we use threshold activation function in such a network?   (4+3+3)
    b) How does the architecture of an ANN affect the performance of MLP?   (5)
    c) Discuss on the significance of learning rate and momentum factor used in MLP.   (5)

4. a) How does a Kohonen's Self Organizing Feature Map (SOFM) Network differ from an MLP? What do you understand by the term "Self Organization"?   (5+3)
    b) Describe the working principle of SOFM.   (8)
    c) How does a SOFM network cluster a dataset? Explain.   (4)

5. a) What is the role of selection procedure in Genetic Algorithm (GA)?   (4)
    b) Write down the significance of genetic operators used in GA. Why are they executed with certain probabilities? Will the performance be affected if we apply mutation first and then crossover?   (5+3+3)
    c) Write down the distinguishing characteristics of GA.   (5)

6. a) Draw the differences between a fuzzy set and a crisp set.   (5)
    b) Discuss on various types of cardinality associated with a fuzzy set.   (6)
    c) Let $X = [1,10]$, A = Small Integers, B = Integers close to 4. Find $A \cap B$.   (4)
    d) Model "young" with a suitable membership function. With this, model "not very young" and "too young".   (5)

7. a) Discuss on Cartesian Product and Fuzzy Relation. (6)

b) In the field of Computer Networking there is an imprecise relationship between the level of use of a network communication bandwidth and the latency experienced in a peer-to-peer communications. Let x be a fuzzy set of used levels (in terms of percentage of full bandwidth used) and Y be a fuzzy set of latencies with the following membership functions.

$$X = \{0.2/10 + 0.5/20 + 0.8/40 + 1.0/60 + 0.06/80 + 0.1/100\}$$
$$Y = \{0.3/0.5 + 0.6/1 + 0.9/1.5 + 1.0/4 + 0.6/8 + 0.3/20\}$$

Find the Cartesian product represented by a relation $R = X \times Y$.

Now suppose we have a second fuzzy set of bandwidth usage as follows:
$$Z = \{0.3/10 + 0.6/20 + 0.7/40 + 0.9/60 + 1/80 + 0.5/100\}$$
Find $S = Z_{1x6} \cdot R_{6x6}$ using max-min composition. (6+8)

8. a) How do you repair infeasible solution while executing 0/1 Knapsack Problem using GA? (4)

b) Derive Schema Theorem. (8)

c) How can you use Hopfield Model of Neural Network for classification? (8)