Model Answers AV 8355

Department of CSIT

MCA Semester -V Year: 2015 Paper Title: Soft Computing Techniques Max Marks: 60

Section A: (All 10 questions are compulsory) 10X2=20

Very Short Answer Questions: Write very short answers to following questions. Please attempt questions of Section A, together and write proper question number for each answer.

Use text book Fuzzy Sets and Fuzzy Logic (FSFL) by Klir and Yuan for elaboration, contact for further explanation/clarification on any problem/question.

1. Compare between soft computing and hard computing.

Soft computing is used under uncertain conditions while hard computing (conventional computing) is used for accurate and certain conditions. (or similar comparisons)

2. Name any four techniques used in soft computing.

ANN, GA, PSO, Fuzzy logic can be used in soft computing.

3. Draw a 4-5-1 artificial neural network.

Draw with 4 inputs, 5 in hidden layer and single output with usual with, bias and other units.

4. What is the role a transfer function in artificial neural networks?

The transfer function also called activation function transfers (changes) the net input activity or sum of products of connecting weights with respective inputs and bias to produce output of the neural network.

5. What is a fuzzy number?

A fuzzy number is an uncertain number not as accurate as 1,2,3 which we use in our daily life. E.g. about 5 includes 6 and 4 in its range under triangular fuzzy number.

6. Write any two fuzzy membership functions with diagrams.

Draw for triangular and trapezoidal membership functions.

7. Why do we use a mutation in genetic algorithm?

When we do not get a new (different) offspring even by a crossover operation then to change the offspring, we flip or change the bit/bits of the offspring to get different offspring.

8. Draw any binary and real valued chromosome in a genetic algorithm.

[1,0,0,0,1,1,..] binary and [1.2,-2.3,4.5,…] for real coded GA.

9. What is particle swarm optimization?

It is a swarm intelligence based technique to determine optimum solution of a problem.

10. Write a problem statement which you would like to solve by a PSO (do not solve it).

Let $z = f(x) = x^2 + 3x - 19$ subject to $-1 <= x <= 1$.

Section B: (Attempt any 4 questions out of 7 questions) 4X10=40

Descriptive Questions:

1. Explain soft computing with names of any three techniques used in it.

Here write the meaning, advantages, applications, limitations of soft computing with additional focus on any three techniques.

2. Take a single layer error back propagation neural network of your choice and find out its error up to five iterations. Show the results table.

Take any ANN with back propagation, weights, bias, inputs and transfer function of your choice and find out change in weights, errors for five iterations and prepare a table of readings.

3. Write short notes on (a) transfer functions (b) recurrent neural networks.

   (a) Transfer function: which produces output of neural network, write in brief about some transfer functions, like sigmoid, linear, hard limiter etc with figures and examples.

   (b) Recurrent neural network: when the output of an ANN is fed back as an input, such a situation is commonly known as recurrent ANN and recursively it produces outputs. (details and figures are expected)

4. What do you mean by fuzzy sets? What are alpha cuts and strong alpha cuts, explain by taking any suitable example.

Describe fuzzy sets with their advantages and other details. Pl. refer to page 19-20 of FSFL or write any other example.

5. Find out arithmetic operation (a) [2,5] + [1,3] (b) [0,1]- [-6,5] (c) [-1,1] . [-2,-0.5] (d) [4,10] / [1,2]

(a) [3,8] (b) [-5,7] (c) [-2,2] (d) [2,10]

6. Take any maximization problem with some objective function and some constraints. Apply genetic algorithm to find its maximum value in first generation.

Let $z = f(x) = x^2 + 3x - 19$ subject to $-1 <= x <= 1$ apply selection, crossover, mutation and other operations to find out fitness after first iteration.

7. Write short notes on (a) evolutionary computing (b) Particle swarm optimization.

   (a) Evolutionary Computation: It includes finding better solutions (optimized) using principles of evolution. Genetic Algorithm, Genetic Programming are popular examples under EC. Write in brief about GA or GP.

   (b) PSO: using the concept of birds flocks ,PSO was developed. Write details with an example of PSO, draw any swarm to support your answer.