BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – Bachelor of Science (Honours) in Computer Science

Course Name – Soft Computing

Course Code – BCS603A

(Semester – 6)

Time allotted: 3 Hours   **Full Marks : 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)   10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) A perceptron is:

   a. a. a single layer feed-forward neural network with pre-processing
   b. an auto-associative neural network
   c. a double layer auto-associative neural network
   d. a neural network that contains feedback

(ii) Which of the following cannot be stated using fuzzy logic?

   a. Color of an Apple
   b. Height of a person
   c. Date of Birth of a person
   d. Speed of a car

(iii) On what parameters can change in weight vector in an Artificial Neural Network depend?

   a. learning parameters
   b. input vector
   c. learning signal
   d. all of the mentioned

(iv) Fuzzy set theory defines fuzzy operators. Choose the fuzzy operators from the following

   1. AND   2. OR   3. NOT   4.Ex-OR

   a. 1,2
   b. 3,4
   c. 1,2,3
   d. all of the mentioned

(v) The values of the set membership is represented by

   a. Discrete set
   b. Degree of truth
   c. Probabilities
   d. Both b and c

(vi) Which of the following is true for neural networks?
(1) The training time depends on the size of the network.
(2) Neural networks can be simulated on a conventional computer.
(3) Artificial neurons are identical in operation to biological ones.

    a. All of the above   b. 2 is true

    c. 1 and 2 are true   d. none of the mentioned

(vii) Which of the following equation represent perceptron learning law?

    a. $\Delta w_{ij} = \eta(in_i)$ b. $\Delta w_{ij} = \eta(target_j - out_j)in_i$

    c. $\Delta w_{ij} = \eta(target_j)in_i$ d. $\Delta w_{ij} = \eta(target_j - in_i)out_j$

(viii) A neuron with 3 inputs has the weight vector [0.2 -0.1 0.1]^T and a bias $\theta = 0$. If the input vector is X = [0.2 0.4 0.2]^T then the total input to the neuron is:

    a. 0.2   b. 1.0

    c. 0.02   d. -1.0

(ix) What are 3 basic types of neural nets that form basic functional units among
i) feedforward ii) loop iii) recurrent iv) feedback v) combination of feed forward & back

    a. i, iii, v   b. i, ii, iii

    c. i, iv, v   d. i, iii, v

(x) Which of the following can be used for clustering of data?

    a. Single layer perception   b. Multilayer perception

    c. Self-organizing map   d. Hopfield network

Group – B

(Short Answer Type Questions)   3 x 5 = 15

Answer any *three* from the following

2.   Let A, B be fuzzy sets defined on universe of discourse X.   2+3

(i) Then prove that

$$|A| + |B| = |A \cup B| + |A \cap B|, where \cup, \cap$$ are standard fuzzy intersection and union operations respectively

(ii) Justify or falsify –

$(A\Delta B)\Delta C = A\Delta(B\Delta C)$, where the symmetric difference of A and B is defined as $A\Delta B = (A \cap \bar{B}) \cup (\bar{A} \cap B)$

3.   Consider the set of people in the following age groups: 5

     {0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70 and above}

     Represent the fuzzy sets "young", "middle-aged", and "old" in a single graph by suitable membership functions.

4.   Explain ADALINE and MADALINE models of computation.   5

5. (i) What is the difference between Fuzzy System and Stochastic System?   2+3

    (ii) Why XOR Gate cannot be implemented using single layer perceptron?

6. (i) How many layers are there in a Kohonen network (Self Organizing Map) and what do they do? 3+2

(ii) How are the weights in a Self Organizing Map updated?

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following

7. (a) What do you mean by fuzzy logic? Explain fuzzy Propositions and Fuzzy connectives with suitable Example. 7

(b) What is Defuzzification? Explain different defuzzification method with an example? 8

8. (a) A neuron with 3 inputs has the weight vector w= [0.1, 0.3 -0.2]. The activation function is sigmoidal activation function. If input vector is [0.8 0.6 0.4] then find the output of neuron. 10

(b) Define crossover operator in genetic algorithm. Discuss about different types of crossovers. 2+3

9. (a) What is the role of 'backpropagation' in learning? 2

(b) Write down the algorithm for Backpropagation learning in multilayer ANN. 10

(c) What do you understand by 'learning rate'? How the value of 'learning rate' is set typically? 3

10 (a) Find Union, Intersection, Complements and Difference between the following fuzzy sets: 3
$\underline{A}$ = {1/1.0, 0.75/1.5, 0.3/2, 0.15/2.5, 0/3.0}
$\underline{B}$ = {1/1.0, 0.6/1.5, 0.2/2, 0.1/2.5, 0/3.0}

(b) As an example, store two strings viz. (0 1 1 0 1) and (1 0 1 0 1) in the appropriate model and check whether it can recall (1 1 1 0 1). 12

11. (a) What do you understand by 'Membership function' in a fuzzy set? 2

(b) Explain the following membership function for a fuzzy set 10
(i) Triangular, (ii) Trapezoidal, (iii) Gaussian and (iv) Cauchy

(c) Explain Roulette Wheel selection method in GA. 3