Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023

Semester : Semester IV - 2021
Course Code : CSE3016
Course Name : Sem IV - CSE3016 - Neural Network and Fuzzy Logic
Program : CAI,CEI&CST

Date : 21-JUN-2023
Time : 9.30AM - 12.30PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **(10 X 2 = 20M)**

1. Explain in brief the Competition stage in Self Organizing Map Architecture.
(CO2) [Knowledge]

2. Explain what do you understand by the term normality in a fuzzy set. If a fuzzy set is not normal, then what is it referred as.
(CO3) [Knowledge]

3. Identify the activation function which does not activate all the neurones at the same time. Explain in brief.
(CO1) [Knowledge]

4. Define bipartite graph in fuzzy relation.
(CO3) [Knowledge]

5. Classify the different types of fuzzy propositions.
(CO4) [Knowledge]

6. Explain the terms core and cardinality with respect to fuzzy sets.
(CO3) [Knowledge]

7. State how many layers Radial Basis Function Network contains.
(CO2) [Knowledge]

8. List the benefits of neural network.
(CO1) [Knowledge]

9. Explain the XOR problem in brief.
(CO2) [Knowledge]

10. Define Generalized modus Tollens.
(CO4) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(5 X 10 = 50M)**

11. Explain the importance of derivation of activation function with an example.
Explain in brief about Tanh function.Discuss the advantages and disadvantages of Tanh function.
(CO1) [Comprehension]

12. Explain the architecture of Self Organizing Maps.
(CO2,CO3) [Comprehension]

13. Identify the neural network which has only one hidden layer and uses a Gaussian Activation function. Explain the design and development of it.
(CO2) [Comprehension]

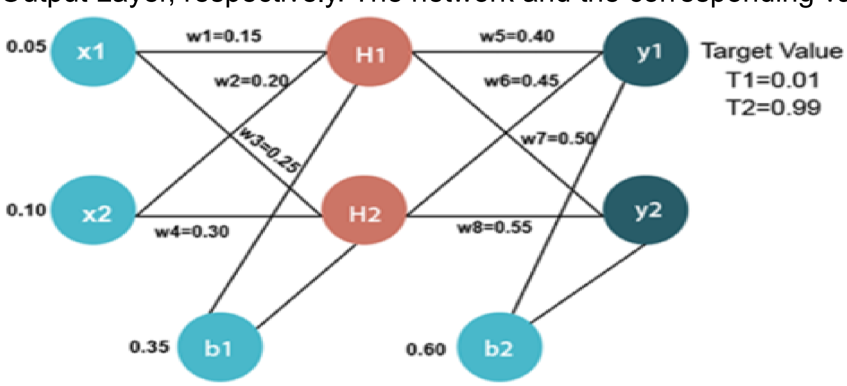
14. Let us assume two fuzzy sets A and B. The fuzzy set A contains the memberships μA(x)={(x1,0.3), (x2, 0.5), (x4, 0.7)}, and the fuzzy set B contains the memberships μB(X)={(x1,0.2),(x2, 0.8), (x3, 0.4)}. Prove that i) μ1-((1-A) ∧(1-B))(X) = μ(A∨B)(X) ii) μ(1-A) ∧(1-B)(X) = μ(1-(A∨B))(X).
(CO3,CO4) [Comprehension]

15. Let us assume that the multilayer perceptron contains three layers namely input, hidden and output. The input layer contains two nodes X1 and X2 , which takes bipolar value is input. The hidden layer also contains two nodes H1 and H2 and the output layer contains one node Y. The weights between input nodes to hidden nodes are W11, W12, W21, W22. Similarly, the weights between hidden nodes and output node are WH1Y, WH2Y. The activation function for hidden and output units are step activation function. How XNOR is constructed using this network? Describe. (CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **(2 X 15 = 30M)**

16. A researcher is working on his first neural network to implement a multilayer perceptron. There are two units in the Input Layer, two units in the Hidden Layer and two units in the Output Layer. The w1,w2,w2,…,w8 represent the respective weights. b1 and b2 are the biases for Hidden Layer and Output Layer, respectively. The network and the corresponding values are as follows:



The researcher wants to find out the total error at the end of one epoch in the network and the updated weights of w1 and w5 at the end of the backward pass. He considers sigmoid function as the activation function for the network he has designed. (CO2) [Application]

17. State what do you understand by Fuzzy Equivalence and Fuzzy Tolerance.
Find out whether the following fuzzy relation is both equivalent and tolerant (rows and columns depict a diagraph). Give reasons for the same.

$$\bar{R} = \begin{bmatrix} 1.0 & 0.8 & 0.0 & 0.1 & 0.2 \\ 0.8 & 1.0 & 0.4 & 0.0 & 0.9 \\ 0.0 & 0.4 & 1.0 & 0.0 & 0.0 \\ 0.1 & 0.0 & 0.0 & 1.0 & 0.5 \\ 0.2 & 0.9 & 0.0 & 0.5 & 1.0 \end{bmatrix}$$

(CO3,CO4) [Application]