Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023

Semester : Semester V - 2020
Course Code : CSE3006
Course Name : Sem V - CSE3006 - Neural Networks and Fuzzy Logic
Program : B.Tech. CST

Date : 11-JAN-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.

PART A

ANSWER ALL THE TEN QUESTIONS **10 X 2 = 20M**

1. Mention two limitations of Binary Step Function. (CO1) [Knowledge]

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

3. Explain why Radial Basis Function is faster than Multi Layer Perceptrons. (CO2) [Knowledge]

4. How are Self Organizing Maps different from other Neural Networks? (CO2) [Knowledge]

5. Name the integral parts of an Artificial Neural Network. (CO2) [Knowledge]

6. What is a singleton in a fuzzy set? How is it denoted? (CO3) [Knowledge]

7. Compare between fuzzyness and probability (using two points). (CO3) [Knowledge]

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

9. Explain the term generalized modulus ponens with respect to Fuzzy Inference System. (CO4) [Knowledge]

10. Describe what you understand by the normality and sub-normality of a fuzzy set theory. (CO4) [Knowledge]

PART B

ANSWER ALL THE FIVE QUESTIONS **5 X 10 = 50M**

11. Classify the basic types of Neural Network Architecture in brief.

(CO1) [Comprehension]

12. Explain the design and development of a Radial Basis Function Network.

(CO2) [Comprehension]

13. Explain the architecture of Self Organizing Maps.

(CO2) [Comprehension]

14. Explain what you understand by Fuzzy Tolerance Relation. Explain with an example.

(CO3) [Comprehension]

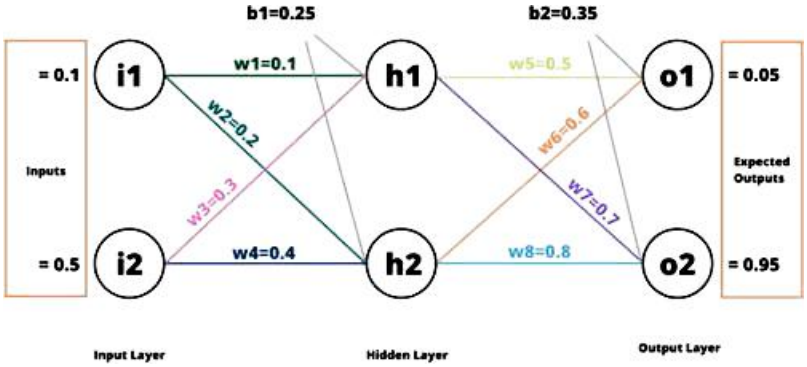
15. What is a Fuzzy Inference System? Classify the different Inference Process of a Fuzzy Inference System.

(CO4) [Comprehension]

PART C

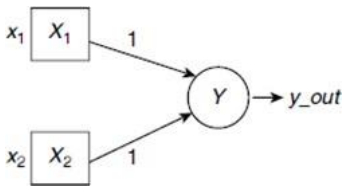
ANSWER ALL THE TWO QUESTIONS **2 X 15 = 30M**

16. a.A researcher is working on his first neural network to implement 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.

b.We need to design The McCulloch-Pitts neuron to perform logical *OR* operations as shown in the Figure below. Identify which activation function can be used for the purpose. Also demonstrate the truth table for the same. Explain the working principle in brief.



(CO2) [Application]

17. a.Let a, b, c, d, and e be fi ve students who scored 55, 35, 60, 85 and 75 out of 100 respectively in Mathematics. Th e students constitute the universe of discourse U = {a, b, c, d, e} and a fuzzy set M of the students who are good in Mathematics is defi ned on U with the help of the following membership
function.

$$\mu_M(x) = \begin{cases} 0, & if \quad x < 40 \\ \dfrac{x-40}{40}, & if \quad 40 \le x < 80 \\ 1, & if \quad x \ge 80 \end{cases}$$

Find the membership value of each student. Also find the supp, core and cardinality values of the fuzzy set M.

b.Let us consider the reference sets X = {m, n} and Y = {p, q, r} and the fuzzy sets A and B defined on them.

$$A = \frac{0.3}{m} + \frac{0.7}{n}, \qquad B = \frac{0.5}{p} + \frac{0.1}{q} + \frac{0.8}{r}$$

Find the catersian product using the max-min composition rule. (CO3) [Application]

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