ANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, MARCH - 2021

Neural Network and Fuzzy Logic [ICE4014]

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates : Answer ALL questions and missing data may be suitably assumed.

22-03-2021

- 1A. Define learning. Explain different types of learning with suitable example for each.
- 1B. With a flow chart explain different stages of training a neural network employing Back propagation algorithm
- 1C. Design a Hebb net to implement NOR function with a) binary inputs and targets b) binary inputs and bipolar targets.

(3+3+4)

- 2A Find the weights of Perceptron network for realizing ANDNOT function when all the inputs are presented only one time. Use bipolar inputs and targets.
- $2\mathbf{B}$ Construct a Kohonen self-organizing map to cluster the four given vectors [0 0 1 1], [1 0 0 0], [0 1 1 0] and [0 0 0 1]. The number of clusters to be formed is two. Assume an initial learning

0.2 0.91 rate of 0.5. Consider the weight matrix $W = \begin{bmatrix} 0.4 & 0.7 \\ 0.6 & 0.5 \end{bmatrix}$ 0.8 0.3

2CDevelop Mexican Hat algorithm for a simple net with seven units. The activation function for this

unit is $\begin{cases} 0 & if \ x < 0 \\ x & if \ 0 \le x \le 2 \\ 2 & if \ x > 2 \end{cases}$ $R_1 = 1, R_2 = 2$ $C_1 = 0.6$ and $C_2 = -0.4$. The external

signal s is (0.0, 0.5, 0.8, 1.0, 0.8, 0.5, 0.0)

(4+3+3)

- 3A Define a) Weights b) Threshold c) Learning rate d) Momentum factor.
- 3B Find the lambda cut relation for Lambda= 0.1, 0+, 0.3, 0.6, 0.7, 1.0 for the fuzzy relation

$$R = \begin{bmatrix} 1 & 0 & 0.2 & 0.1 & 0.4 \\ 0.6 & 0.7 & 0.3 & 0.5 & 0 \\ 0.8 & 0.9 & 0.6 & 0.3 & 0.2 \\ 0.1 & 0 & 1 & 0.9 & 0.7 \end{bmatrix}$$

3C Define Membership function and draw different membership functions. Explain the features of membership function.

(3+4+3)

- 4A Explain the inference approach used for membership value assignment.
- 4BWhat is defuzzification? Explain four methods of defuzzification techniques.
- 4CWrite a note on Fuzzy tolerance and equivalence relation with an example

(3+4+3)

- 5A Explain functions of each part of Fuzzy Logic Controller and discuss a fuzzy logic controller used to simulate aircraft landing problem.
- 5B Write short notes on i) Fuzzy propositions ii) Decomposition of fuzzy Rules.
- 5C Discuss in detail one real world application of neural networks.

(4+3+3)
