

Code No: 138AR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech IV Year II Semester Examinations, July - 2021****ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks

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- 1.a) Justify the statement “Neuron Inhibition depends on Activation function” using different types of activation functions.
- b) With a supervised learning algorithm, specification of target output values may be done, but at the end of the learning, target values are not achieved. Discuss the reasons why it happens. [8+7]
- 2.a) Discuss the implementation of Boolean function using network of perceptrons.
- b) A neuron with 4 inputs has the weight vector $w = [4, 1, 2, 3]^T$ and a bias = 0 (zero). The activation function is given by $f(\text{net}) = 2 \times \text{net}$. If the input vector is $x = [4, 8, 5, 6]^T$ then find the output of the neuron. [8+7]
- 3.a) Use outer product rule to store the vectors $[1 \ 1 \ -1 \ 1]$ and $[1 \ 1 \ 1 \ -1]$ in an auto-associative Network. Also find the weight matrix and test the vector using $[1 \ -1 \ 1 \ -1]$, $[-1 \ 1 \ 1 \ -1]$ and $[0 \ 1 \ 1 \ 1]$ as different inputs.
- b) Find the weight matrix in bipolar form for the BAM using outer product rule for the following input-output vector pairs: $S(1) = (1 \ 0 \ 1 \ 0)$, $S(2) = (0 \ 1 \ 1 \ 1)$ and $t(1) = (0 \ 1)$ $t(2) = (1 \ 0)$. Test the response of the network on each of the input pattern using the unit step function as the output unit’s activation function. [7+8]
- 4.a) Justify the following statement: “Partial membership is allowed in fuzzy sets”.
- b) Using intuition, assign the membership function for i) population of men and ii) library. [7+8]
- 5.a) Consider the discrete fuzzy set defined on the universe $X = \{a, b, c, d, e\}$ as
- $$\underline{E} = \left\{ \frac{1}{a} + \frac{0.8}{b} + \frac{0.5}{c} + \frac{0.3}{d} + \frac{0}{e} \right\}$$
- Using Zadeh’s notation, find the λ cut sets for $\lambda = 1, 0.8, 0.5, 0.3, 0^+$ and 0
- b) Prove that λ -cut relation of a fuzzy tolerance relation results in crisp equivalence relation. [8+7]
- 6.a) “The generalized Delta rule solves the credit assignment problem in the training of multi-layer Feed forward networks.” Discuss.
- b) Construct a two node continuous Hopfield network. Assume the conductance is $gr_1 = gr_2 = 5 \text{ mho}$. The gain parameter is $\lambda = 1.3$ and the external inputs are zero. Calculate the Accurate energy value of the state $y = [0.1 \ 0.1]^T$. [8+7]

- 7.a) Using inference method find the membership values of the triangular shapes for each of the following triangles:
- i) $30^\circ, 60^\circ, 90^\circ$
 - ii) $45^\circ, 65^\circ, 70^\circ$
 - iii) $85^\circ, 55^\circ, 40^\circ$
- b) Design a Hebb net to implement logical AND function with
- i) binary inputs and targets and
 - ii) binary inputs and bipolar targets. [7+8]
- 8.a) Use Madeline network, implement XOR function with bipolar inputs and targets. Assume the required parameters for training the network.
- b) Find the weight matrix required to store the vectors $[1 \ -111-1]$, $[11 \ -11-1]$, $[-111 \ 1-1]$ and $[11-1 \ -11]$ in w_1, w_2, w_3, w_4 respectively. Calculate the total weight matrix to store all the vectors and check whether it is capable of recognizing the same vectors presented. Perform the association for weight matrix with no self-connection. [8+7]

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