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ıester V(B.Tech)

Er. No. 20183908

Academic Year: 2022-23

Jaypee University of Engineering & Technology, Guna

T-3 (Odd Semester 2022)

18B11CI932-ARTIFICIAL NEURAL NETWORK

Maximum Duration: 2 Hours

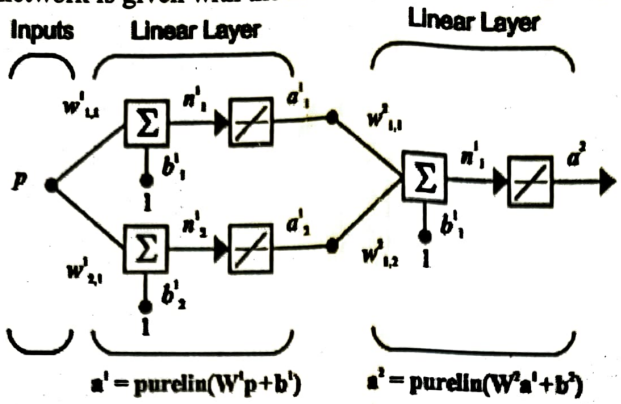
Maximum Marks: 35

Notes:

1. This question paper has **six** questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

		Marks	CO No.
Q1.	Discuss the functioning of ADALINE networks with the help of suitable diagram. How mean square error affect the performance of the network?	[05]	CO2
Q2.	Sketch a contour plot to find the minimum of the following function $$F(x) = \frac{1}{2}x^T \begin{bmatrix} 6 & -2 \\ -2 & 6 \end{bmatrix} x + [-1 \; -1]x$$ Perform two iterations of steepest descent algorithm with learning rate α=0.1 and find its maximum stable learning rate.	[05]	CO3
Q3.	Examine how the multilayer perceptron can be used to solve the problem of XOR gate, with the help of optimal decision boundaries.	[05]	CO4
Q4.	Consider two categories of vectors. Category I consists of $\left\{\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}-1\\2\end{bmatrix}\right\}$. Category II consists of $\left\{\begin{bmatrix}0\\-1\end{bmatrix}, \begin{bmatrix}-4\\1\end{bmatrix}\right\}$. We want to train a single-neuron ADALINE network without a bias to recognize these categories (t = 1 for Category I and t = -1 for Category II). Assume that each pattern occurs with equal probability. (a) Draw the network diagram. (b) Take four steps of the LMS algorithm, using the zero vector as the initial guess (one pass through the four vectors above - present each vector once). Use a learning rate of 0.1. (c) What are the optimal weights? (d) Sketch the optimal decision boundary. (e) How do you think the boundary would change if the network were allowed to have a bias?	[07]	CO3
Q5.	Design a Hopfield network to recognize the two prototype vectors $\left\{\begin{bmatrix}1\\-1\end{bmatrix}, \begin{bmatrix}1\\1\end{bmatrix}\right\}$. Calculate the network output if the input pattern is $\begin{bmatrix}0.5\\-0.5\end{bmatrix}$.	[05]	CO5

Q6. The two layer network is given with the following input and target $\{p = 1, t = 2\}$. **[08]**



The initial weights and biases are

$$W^1(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}, W^2(0) = [-1 \ 1], b^1(0) = \begin{bmatrix} 2 \\ 1 \end{bmatrix}, b^2(0) = [3]$$

(a) Compute the output and error by propagating forward through the network.
(b) Evaluate the sensitivities by backpropagating through the network.
(c) Update the weights and biases.