

Attempt All Questions

- 1-a) Discuss the human brain can generalize. Explain why use neural networks and what are used for? List the difference between computational and biological neurons.
b) Explain pattern recognition using TAN model. How to recognize three patterns by TAN
c) Derive an expression for tanh used as an activation function using bipolar devices.

- 2-a) Describe the basic ideas of the perceptron proposed by Rosenblatt and how to Improve such model.

- b) Perform training steps using delta learning rule with the initial weight $w^1 = [1 \ -1 \ 0]^T$, $c = 0.25$, $\lambda = 1$ and its inputs are

$$x_1 = \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix}, d_1 = -1, \quad x_2 = \begin{bmatrix} 1 \\ -2 \\ -1 \end{bmatrix}, d_2 = 1, \quad x_3 = \begin{bmatrix} 2 \\ 2 \\ 3 \end{bmatrix}, d_3 = -1$$

- 3-a) Outline the biological neuron and describe how this is related to MCP neuron.

- b) The Hebbian training of a single neuron with the initial weight

$$w^1 = [1 \ 0 \ 1 \ 1]^T, \text{ for } c = 1, \lambda = 1, \text{ using 4 inputs :}$$

$$x_1 = \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix}, \quad x_2 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \quad x_3 = \begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}, \quad x_4 = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

Find final weights using :

- i) bipolar binary $f(\text{net})$. ii) bipolar continuous $f(\text{net})$

- 4-a) Describe multilayer perceptron(MLP), and explain why we prefer to use sigmoid Function. How setup MLP ?

- b) Explain the structure of Hopfield net , its operation and its applications?
c) Explain the basic concept of radial basis function(RBF)and main features.
Prove that XOR can implement linearly separable form using RBF.

- 5-a) Describe Backpropagation(BP),and how such algorithm is to be better ?

- b) Explain Hopfield net , its operation and its applications?
c) Define that digital implementation of ANNs can be performed using FPGA.
Write VHDL code and explain structure diagram for neuron implementation using FPGA technology.