Short Questions

1. What is the significance of activation function in neural networks? Explain different activation functions?
2. Differentiate hard and soft computing.
3. Explain the principle of supervised and unsupervised learning schemes of a neural network.
4. Why do we use a bias value in neural network?
5. How do we model an artificial neuron from a biological neuron.
6. Define delta rule? Explain significance of delta rule in defining the weights?
7. What are the factors that impact the number of training epochs required for a Perceptron to reach convergence?
8. What are radial basis functions, and how are they used in the hidden layer of an RBF network?
9. What is the fundamental architecture of a Radial Basis Function network, and how does it differ from other neural network architectures?
10. How are the centers and widths of radial basis functions typically determined or optimized during the training process?

Long Questions

11. Given an ADALINE model with two input features, initial weights of [0.5, -0.3], a learning rate of 0.1, and a target output of 0.7, calculate the new weights after one iteration using the delta rule.
12. If you have a set of training data with three input features and the following errors for an ADALINE model: [-0.2, 0.1, -0.3], calculate the updated weights using gradient descent with a learning rate of 0.05.
13. In a MADALINE model with three input features and two output neurons, if the weights connecting the input features to the first output neuron are [0.2, -0.3, 0.5] and the weights connecting the input features to the second output neuron are [-0.1, 0.4, -0.2], calculate the outputs for a given input [0.7, -0.6, 0.3].
14. Using the LMS (Least Mean Squares) algorithm, calculate the updated weights for a MADALINE model with a learning rate of 0.01, initial weights of [0.1, -0.2, 0.3], and a target output of 0.8 for a given input [0.5, -0.3, 0.2].
15. For a binary classification problem with two input features and a perceptron model, if the weights are [0.3, -0.2] and the threshold is 0.4, determine the class label (1 or -1) for a given input [0.6, -0.1].
16. Calculate the new weights for a perceptron model with initial weights [0.4, -0.3], a learning rate of 0.2, and the following errors for a set of training data: [0.1, -0.2, 0.3].

17. In a feedforward Multilayer Perceptron with one hidden layer and two input features, if the weights connecting the input layer to the hidden layer are [0.2, -0.3] and the weights connecting the hidden layer to the output layer are [0.5, -0.1], calculate the output for a given input [0.7, -0.6].
18. Using the backpropagation algorithm, update the weights for the hidden layer and output layer of a Multilayer Perceptron with initial weights [0.4, -0.2] for the hidden layer and [0.1, -0.3] for the output layer, a learning rate of 0.05, and a target output of 0.9 for a given input [0.6, -0.5].
19. Given a Radial Basis Function network with two input features and two radial basis functions with centers at [0.2, -0.1] and [-0.3, 0.4], calculate the activations of these Gaussian radial basis functions for a given input [0.5, -0.2].
20. Solve the XOR problem using an RBFN and determine the set of weights that yields the best performance.