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BT-5/D-23 45266

ARTIFICIAL NEURAL NETWORKS
PC-CS-AIDS-311A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is an Artificial Neural Network (ANN), and how does it draw inspiration from biological neural networks ?

   (b) Define state space representation of the problem. Provide examples of real-world systems and processes that can be modeled using state space representation.

2. (a) What are the various activation functions commonly used in ANNs, such as sigmoid, ReLU and tanh and what is their significance ?

   (b) What is Hebbian learning and how does it contribute to the development and adaptation of neural networks ?

Unit II

3. (a) How do you train an ANN using the back-propagation algorithm ? Describe the forward pass and backward pass in this context.

   (b) What is the role of regularization techniques, such as weight decay, in training RBF networks and preventing over-fitting ?

4. (a) What is the significance of the weight matrix and bias terms in a feed forward ANN, and how are they used in the computation of network outputs ?

   (b) Explain the role of radial basis functions in RBF networks and how they contribute to the network's ability to approximate complex functions ?

Unit III

5. (a) What are associative memory networks, and how do they differ from conventional feed forward neural networks ?

   (b) Describe the significance of stability and convergence in associative memory networks during pattern retrieval.

6. (a) What is Bidirectional Associative Memory (BAM) and how does it differ from other neural network models like feedforward or recurrent networks ?

(b) How is the delta rule used to update the weights of connections in a neural network during the learning process ? Discuss.

Unit IV

7. (a) Explain the concept of unsupervised learning in the context of SONNs. How do these networks learn and adapt without explicit labels ?

(b) Describe the steps involved in training a Backpropagation Neural Network in MATLAB for face recognition.

8. (a) How does a perceptron perform binary classification and what is the role of the activation function in this process ?

(b) Describe the mechanism by which Winner Take All learning encourages competition and selection among neurons.