Exam.Code:0919
Sub. Code: 33471

2124

B.E. (Computer Science and Engineering)
Seventh Semester
Elective - III
CS -705B: Neural Network

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

	Section-A	
Q1.	a) Define artificial neuron. Describe the basic structure of an artificial neuron. b) Compare Hebbian learning and competitive learning mechanisms in neural networks. c)What is overfitting in neural networks? d) How auto-associative and hetero-associative memory networks differ. e) How Principal Component Analysis is used for dimensionality reduction in machine learning applications.	10
	Section-B	
Q2.	a)Define term Neural network. What is the role of various layers in neural network? How many hidden layers can be there in ANN? b) What are the different types of activation functions used in artificial neurons? Explain any two with their mathematical representations and applications.	5 5
Q3.	a) In competitive learning, how are the weights of the winning neuron updated after competition? Explain the steps involved in this weight adjustment process. b) Describe the gradient descent algorithm. How is it used for optimizing the weights of neural networks during training?	5 5
Q4.	a) Consider a multi-layer perceptron (MLP) with 2 input neurons, 2 hidden neurons, and 1 output neuron. The input values are: • Input: [0.3, 0.7] • Weights from input to hidden: [w1 = 0.2, w2 = 0.4], [w3 = 0.1, w4 = 0.3] • Weights from hidden to output: [w5 = 0.5, w6 = 0.7] • Activation function: Sigmoid Compute the output of the MLP after two forward pass. (Make suitable assumptions) b) What is the linear separability condition in the context of perceptron? Why is this concept crucial in determining the success of a single-layer perceptron?	6 4
	Section-C	
Q5.	a) Explain the process of training an RBF network. How are the centers and widths of radial basis functions chosen during training? b) What are the limitations of associative memory networks in terms of scalability and generalization? How can these limitations be addressed?	5 5

Contd……..P/2

Q6.	a)Given the following 2D data points: {(2,3),(3,4),(4,5),(5,6)}, {(2, 3), (3, 4), (4, 5), (5, 6)}, {(2,3),(3,4),(4,5),(5,6)} • Perform PCA on this dataset by first standardizing the data. • Compute the covariance matrix. • Find the eigenvectors and eigenvalues, and project the data onto the first principal component. b) Explain how Hebbian learning can be used to implement PCA. What advantages does Hebbian-based PCA offer over traditional PCA methods?	6 4
Q7.	a)What is vector quantization, and how is it implemented using Self-Organizing Maps (SOM)? b) Describe the role of Mexican Hat networks in SOM. How do these networks contribute to the adaptation and neighborhood function in SOM?	5 5

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