DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

EIGHTH SEMESTER B.TECH (2020-'24 BATCH)

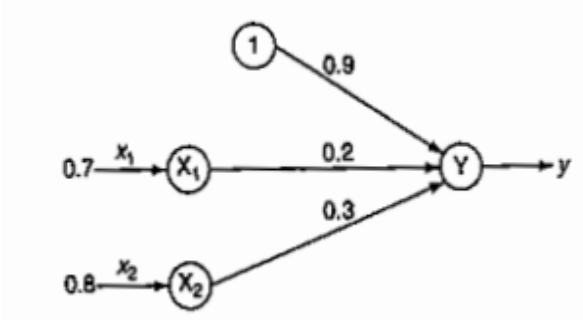
CST444 SOFT COMPUTING

MODULE 1

QUESTION BANK

Part A - 3-mark questions

Question No	Question	Mark	Bloom's taxonomy level	CO
1	1.Differentiate between hard computing and soft computing.	3	L2	CO1
	2.Differentiate between feedforward and feedback networks.	3	L2	CO1
	3.Differentiate between biological neuron and artificial neuron.	3	L2	CO1
2	1.Write any three applications of soft computing.	3	L1	CO1
	2.Compare supervised and unsupervised learning in ANN.	3	L2	CO1
	3.Write a note on different learning mechanisms used in ANN.	3	L1	CO1
3	1.Obtain the output of the neuron for a network with inputs are given as	3	L2	CO1

	[x1, x2, x3] = [0.8, 0.6, 0.4], and the weights are [w1, w2, w3] = [0.1, 0.3, -0.2] with bias =0.35. Also, find output for: i) Binary sigmoidal. ii) Bipolar sigmoidal activation functions.			
	2.Obtain the output of the neuron for a network with inputs are given as [x1, x2] = [0.7, 0.8] and the weights are [w1, w2] = [0.2, 0.3] with bias = 0.9. Use i) Binary sigmoidal activation function ii) Bipolar sigmoid activation function.	3	L2	CO1
	3. Calculate the net output of the following neural network using the bipolar and binary sigmoidal activation network. 	3	L2	CO1
4	1.Why McCulloch-Pitts neuron widely used in logic functions?	3	L2	CO1
	2. Define artificial neural network. Draw its mathematical model.	3	L1	CO1
	3.What is the significance of weights in ANN?	3	L2	CO1

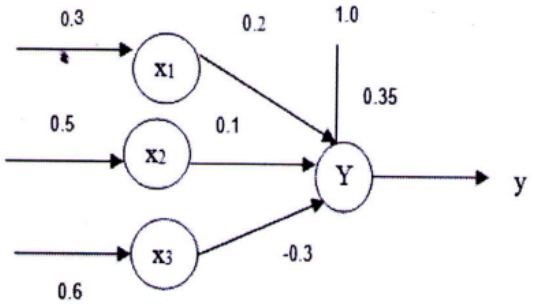
5	1.With the help of an example, state the role of bias in determining the net output of an artificial neural network.	3	L2	CO1
	2. Discuss the concept of M-P Neuron.	3	L1	CO1
	3. Write the three application scope of the neural network.	3	L2	CO1
6	1. List any three activation functions with their equations and graphs.	3	L1	CO1
	2. What is the activation function, and write its importance.	3	L2	CO1
	3. Discuss the concept of Hebb network.	3	L1	CO1

Part B - 14-mark questions

Question No	**Question**	**Mark**	**Bloom's Taxonomy level**	**CO**
7	1a. Implement AND function using M-P neuron model (use binary data representation).	7	L3	CO1
	1b. With the help of a flow chart, explain the training algorithm for the Hebb network.	7	L2	CO1
	2a. Implement NAND function using M-P neuron model (use binary data representation).	7	L3	CO1

	2b. Explain the different types of learning mechanisms used in artificial neural networks with the help of necessary diagrams.	7	L2	CO1
	3a. Implement OR function using M-P neuron model (use binary data representation).	7	L3	CO1
	3b. Explain the different architectures of ANN.	7	L2	CO1
8	1a. Implement XOR function using M-P neuron (use binary data).	9	L3	CO1
	1b. A 4-input neuron has weights 1, 2, 3, and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4,10, 5, and 20 respectively. Predict the output.	5	L2	CO1
	2a. Design a Hebb net to implement the logical AND function. Use bipolar inputs and targets.	8	L3	CO1
	2b. Explain the McCulloh-Pitts neuron model.	6	L2	CO1
	3a. Design a Hebb net to realize the logical OR function. Use bipolar inputs and targets.	8	L3	CO1
	3b. Explain the different types of activation functions used in ANN with the help of graphical representations.	6	L2	CO1
9	1a. Design a Hebb net to implement a logical XOR function. Use bipolar inputs and targets.	9	L3	CO1

	1b.“The Hebb rule is more suited for bipolar data than binary data.” Justify the statement.	5	L2	CO1
	2a. Using the Hebb rule, find the weights required to perform the following classifications: Given that the vectors (1, 1, 1, 1) and (-1, 1, -1,-1) are the members of the same class (target 1), and the vectors (1, 1, 1, -1) and (1, -1, -1,1) are the members of another class (target -1).	7	L3	CO1
	2b. Define linear separability. Justify that the XOR function is non-linearly separable by a single decision boundary line.	7	L2	CO1
	3a. Using the Hebb rule, find the weights required to perform the following classifications: Given that the vectors (1, 1, 1, 1) and (-1, 1, -1, -1) are members of the same class (target 1), the vectors (1, 1, 1, -1) and (1, -1, -1, 1) are not members of the class (target -1).	7	L3	CO1
	3B. With a neat diagram, explain the mathematical model of an artificial neural network.	7	L2	CO1
10	1a. What is soft computing? Explain the difference between soft computing and hard computing.	7	L2	CO1

	1b. Calculate the output of the neuron y for the following network using - l. binary sigmoidal activation function 2. bipolar sigmoidal activation function.  	7	L2	CO1
	2a.Using the Hebb rule, find the weights required to perform the following classifications of the given input patterns shown in figure. The "+" symbols represent the value "l" and empty space indicates "-1". consider "l" belongs to the members of class (so has target value 1) and "0" does not belong to the members of class (so has target value -l).  	9	L3	CO1
	2b. Write a note on various computational paradigms.	5	L2	CO1
	3a. Implement ANDNOT function using McCulloch-Pitts neuron model.	7	L3	CO1
	3b. Explain any 5 applications of soft computing.	7	L2	CO1

11	1a. Given two classes, A and B, with input vectors: A1 = (1,−1,1,−1), A2 = (−1,−1,−1,−1), B1 = (1,1,1,1), B2 = (−1,1,−1,1). Apply the Hebbian learning rule to find the weights that classify A vectors as target 1 and B vectors as target -1.	9	L3	CO1
	1b. Explain the evolution of neural networks.	5	L2	CO1
	2a. Find the weights required to perform the following classifications of given input patterns using the Hebb rule. The inputs are "1" where "+" symbol is present, and " -1 " where "." is present. "L" pattern belongs to the class (target value + 1), and "U" pattern does not belong to the class (target value -1). + . . + . + + . . + . + + + + + + + "L" "U"	9	L3	CO1
	2b. Write a note on the characteristics of artificial neural networks.	5	L2	CO1
	3a. Explain the structure and function of a biological neuron.	9	L2	CO1
	3b.Construct a feed-forward network with five input nodes, three hidden nodes and four output nodes that has lateral inhibition structure in the output layer.	5	L3	CO1
12	1. Explain in detail the architecture of the McCulloch- Pitt neuron model and also realize the 3-input NAND gate and NOR gate using the above neuron model.	14	L2	CO1
	2. Explain the basic models of artificial neural networks.	14	L2	CO1

	3. Classify the input patterns shown in Figure using Hebb training algorithm. The inputs are "1" where "+" symbol is present and " -1 " where "." is present. "L" pattern belongs to the class (target value + 1) and "U" pattern does not belong to the class (target value -1). + + + + + + + . + + . . + + + + + + + . + + . . + . + + + + "L" "U"	14	L3	CO1