BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

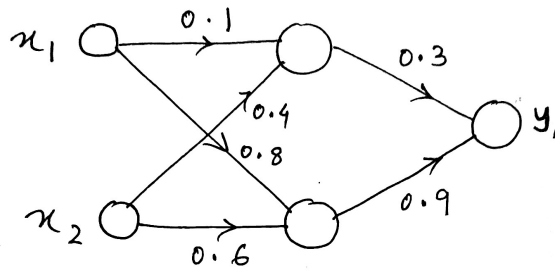
CLASS: BTECH **SEMESTER : VII**
BRANCH: ECE **SESSION : MO/2025**

SUBJECT: EC415R1 NEURAL NETWORKS AND FUZZY SYSTEM

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	List out different types of neurons based on their function. What are the limitations of McCulloch-Pitts Neuron?	[2]	1	2
Q.1(b)	A single-layer neural network is to have six inputs and two out puts. The outputs are to be limited to and continuous over the range 0 to 1. What can you tell about the network architecture? Specifically: i. How many neurons are required? ii. What are the dimensions of the weight matrix? iii. What kind of transfer functions could be used?	[3]	1,2	3
Q.2(a)	Through graphical representation, show that the 3-input OR problem is linearly separable.	[2]	1	1
Q.2(b)	Consider the machine learning model, with two inputs x_1, x_2 and one output y. Given training instances, $(x_1, x_2, y) = (0.4, 0.1, 0.3), (1.8, 0.5, 0.6)$, $w_1 = w_2 = 1.2, b = -1.4$ and the activation function is a symmetrical hard limit function. Compute the Loss functions, $L(w,b) = \frac{1}{2}\sum_{i=1}^{n}\left(y_i - f(x_i)\right)^2$.	[3]	2	4
Q.3(a)	Solve the 2 input-XOR problem by using multilayer Perceptron network.	[2]	2	2
Q.3(b)	Explain the Hebbian learning. What is covariance hypothesis?	[3]	1,2	4
Q.4(a)	What are the different learning strategies used in ML. Briefly explain with suitable block diagram.	[2]	1	2
Q.4(b)	Derive the estimated output of a simple linear regression problem.	[3]	2	3
Q.5(a)	What is the difference between parameters and hyperparameters in ML. Give some examples of structural hyperparameters.	[2]	2	2
Q.5(b)	In the following network, assume that the neurons have a sigmoid activation function with no bias input. Perform two iterations of forward propagation and calculate the error values if the desired output of y is 0.5 and learning rate is 1. Apply error correction learning to update the weights. Assume the inputs $x_1 = 0.35$ and $x_2 = 0.9$.	[3]	2	4



:::::19/09/2025:::::M