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

CLASS: BTECH **SEMESTER : V/ADD**
BRANCH: AIML **SESSION : MO/2025**

SUBJECT: AI301 SUPERVISED LEARNING

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)	Explain with example: (i) True Positives (ii) False Negatives	[2]	1	2
Q.1(b)	Derive the stochastic gradient ascent rule for logistic regression model.	[3]	1	3
Q.2(a)	Elaborate upon the contents of a data matrix, with an example.	[2]	1	2
Q.2(b)	Consider the following data. Applying Naïve Bayes method, find the probability of "$Play = Yes$" for the tuple $X = (Oulook = sunny, Wind\ speed = High)$.	[3]	1	2

Outlook	Wind Speed	Play
Sunny	Low	No
Overcast	Low	Yes
Rainy	Low	Yes
Sunny	Medium	Yes
Overcast	High	Yes
Rainy	Medium	Yes
Rainy	High	No
Dark	Low	No

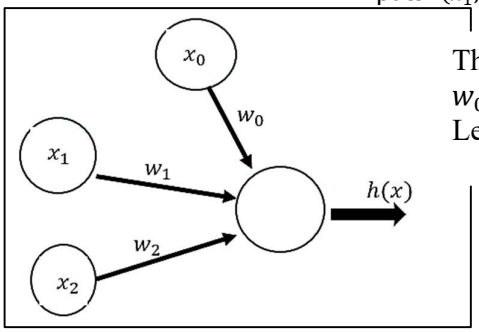
Q.3(a)	Explain the working of the McCulloch and Pitt model.	[2]	2	2
Q.3(b)	When is a model said to be overfitting? How can this be overcome?	[3]	2	3
Q.4(a)	Explain the methods of initializing weights in a neural network.	[2]	2	2
Q.4(b)	For a Multilayer perceptron of two inputs, two nodes in a hidden layer and one output node, compute the output given the following:	[3]	2	2

$W^{[1]} = \begin{bmatrix} 0.5 & -1 \\ 1 & 0.2 \end{bmatrix}$ $W^{[2]} = \begin{bmatrix} 0.4 \\ 1 \end{bmatrix}$ $X = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

There are no bias inputs, and the activation function for hidden and output neurons is Step function with $Threshold = 0$

Q.5(a)	Describe the perceptron learning algorithm.	[2]	2	2
Q.5(b)	Compute the weight updates for one iteration. Activation function for output neuron is Step function with Threshold = 0.	[3]	2	3

Inputs $(x_1, x_2) = (0,0)$, $Target\ y = 0$



The weights are as follows:
$w_0 = 0.02, w_1 = -0.05,\ w_2 = -0.01$
Learning rate = 0.1

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