JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

M.Tech-II Semester (CSE/IT)

COURSE CODE (CREDITS): 22M11CI212 (3) MAX. MARKS: 15

COURSE NAME: Deep Learning Techniques

COURSE INSTRUCTOR: RBT MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculators is not allowed

<table>
<tr><th>Q.No</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q1</td><td>
a) A student implemented perceptron learning algorithm using the following train data and computed the separating boundary as: $x_1 + x_2 - 1 = 0$

<table>
<tr><th>x_1</th><th>x_2</th><th>t</th></tr>
<tr><td>1</td><td>2</td><td>1</td></tr>
<tr><td>2</td><td>3</td><td>1</td></tr>
<tr><td>4</td><td>4.5</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>0.5</td><td>0</td><td>0</td></tr>
<tr><td>0.5</td><td>1</td><td>0</td></tr>
<tr><td>-1</td><td>0</td><td>0</td></tr>
</table>

When he applied this model on the validation samples, he noticed that the accuracy was low. He debugged the code and found that the separating boundary is not computed accurately. Your task is to find :

i. Which point(s) are misclassified in the above samples?
(1, 2, 1) , (0, 0, 0) , (0.5, 1, 0), (-1, 0, 0)

ii. Suggest appropriate corrections to the parameters of the separating boundary. Write the new equation: :...

b) In backpropagation, why is the chain rule essential?
</td><td>1</td><td>2 + 1</td></tr>
<tr><td>Q2</td><td>
a) Explain the Universal Approximation Theorem with necessary assumptions.

b) Which of the following best describes the objective of Gradient
</td><td>1</td><td>2 + 1</td></tr>
</table>

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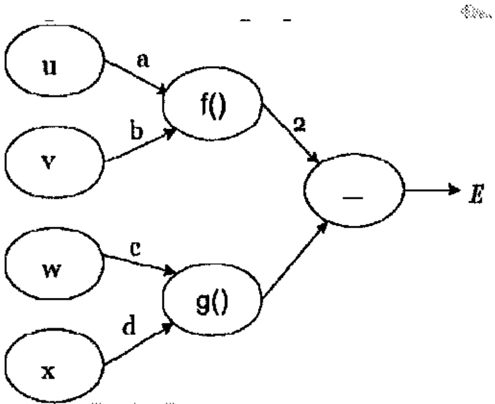
	Descent? i) To maximize the loss function by updating weights ii) To minimize the loss function by iteratively updating parameters iii) To randomly initialize network parameters iv) To compute gradients only during forward propagation		
Q3	Design a Multi-Layer Perceptron (MLP) neural network for solving XOR function of three inputs X1, X2, and X3 having one hidden layer of four perceptrons and one output layer. Properly show and discuss weights, bias, perceptron's activation functions etc.	2	3
Q4	Consider the evaluation of E as given below: $E = h(u, v, w, x) = 2 \times f(au + bv) - g(cw + dx)$  Here u, v, w, x are inputs (constants) and a, b, c, d are parameters (variables). f and g are the activation functions (with z as input) defined as $f(z) = sigm(z)$ and $g(z) = tanh(z)$. E is a function of parameters a; b; c; d. Compute the partial derivatives of E with respect to the parameters a, b.	2	3
Q5	a) What is the difference between covariance and correlation? b) Suppose that the average number of accidents occurring weekly on a particular stretch of a highway equals 3. Calculate the probability that there is at least one accident this week. c) Find $E[X]$, where X is the outcome when we roll a fair die.	1	1 + 1 + 1