JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

M.Tech-II Semester (CSE/IT(Data Science))

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

COURSE NAME: Deep Learning Techniques

COURSE INSTRUCTORS: Dr. Hari Singh MAX. TIME: 1 Hour

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

(b)Marks are indicated against each question in square brackets.

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

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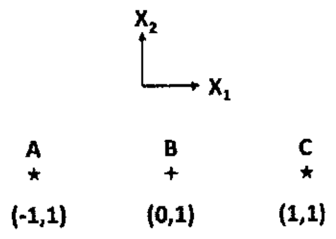
Q1. Design a Multi-Layer Perceptron (MLP) neural network for solving XoR function of three inputs X1, X2 and X3 having one hidden layer of four perceptrons and one output layer. Properly show and discuss weights, bias, perceptrons' activation functions, etc. **[CO1] [04 Marks]**

Q2. Suppose that in a graph, points in a negative region are represented with value -1 and the points in a positive region are represented with value +1. The linear regression line classifies the two regions and has the equation $4x+5y-12=0$. There are two misclassified points with coordinates (3,4) and (4,1) in the positive region and two misclassified points with coordinates (-6,0) and (0,-2) in the negative region. Compute the loss using perceptron crieteria 0/1 loss function. **[CO1] [04 Marks]**

Q3. Consider the two-class data set illustrated in the Figure given below, which is represented in two dimensions denoted by x1 and x2. There are two instances, A and B, of the class denoted by '*' with coordinates (1, 1) and (−1, 1), respectively. There is also a single instance B of the class denoted by '+' with coordinates (0, 1). A neural network with only linear activations will never be able to classify the training data perfectly because the points are not linearly separable. Provide a Multi-Layer Perceptron (MLP) Neural Network linearly separable solution using hidden layer that has ReLU activations.



NOT LINEARLY SEPARABLE

[CO2][04 Marks]

Q4. Consider a situation in which a 1-dimensional function shown below is defined by 1024 repeated steps of the same size and height.

1-dimensional function: 

The function when repeated four times: 

(a) Using a single hidden layer, how many perceptron units are required to realize the 1024 repeated function.

(b) How many minimum numbers of layers and perceptrons in each layer are required to represent the 1024 repeated function? **[CO2] [1.5x2=03 Marks]**