

COURSE CODE(CREDITS): 03

MAX. MARKS: 15

COURSE NAME: Introduction to Deep Learning (19B1WCI738)

COURSE INSTRUCTORS: Dr. Hari Singh, Dr. Kushal Kanwar, Dr. Vipul Sharma

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

Q1. Show that $x^T y = y^T x$ for any two vectors of x, y of dimensionality n by 1. [CO1] [02 Marks]

Q2. (a) What will happen if value of lambda is increased in case of linear regression with L1 regularizer?

[CO1] [1.5 Marks]

(b) Describe bias-variance tradeoff.

[CO1] [1.5 Marks]

Q3. Derive the coefficient matrix of a multiple linear regression using closed form solution that minimizes the training Mean Squared Error (MSE_{train}).

[CO1] [02 Marks]

Q4. There is a dataset of four columns and 1000 rows. Describe the steps involved in adjusting weights and bias of a multiple linear regression model using Stochastic Gradient Descent algorithm.

[CO1] [02 Marks]

Q5. (a) Design a Multi-Layer Perceptron (MLP) neural network for solving XoR function of three inputs X_1, X_2 and X_3 having one hidden layer of two perceptrons and one output layer. Properly show and discuss weights, bias, perceptrons' activation functions, etc.

[CO2] [1.5 Marks]

(b) Can three inputs XoR be realized with a single perceptron? Discuss the problem, if any, through a geometric explanation. How does the two perceptron artificial neural network solve it?

[CO2] [1.5 Marks]

Q6. (a) Draw a feedforward neural network of two hidden layers for predicting the output dependent on four features (Write all the weights, bias, intermediate outputs, and final output notations). The first and second hidden layers have three and two perceptrons respectively. All the perceptrons use sigmoid activation function. Write all the steps in deriving the predicted output.

[CO2] [02 Marks]

(b) How many weights and bias parameters are present in each layer?

[CO2] [01 Mark]