COURSE CODE: 18B1WEC733

COURSE NAME: Machine Learning and Data Analytics–I

COURSE CREDITS: 03

MAX. MARKS: 35

MAX. TIME: 2 Hours

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1. (a) Explain what dimensional reduction means & how it is relevant to data compression. [2] [CO1,

    (b) Explain what gradient descent learning means? [2] CO2]

    (c) State Cover's theorem. [1]

Q2. (a) Explain RLS algorithm and derive its weight update equation for RBF network. [5] [CO3]

    (b) Derive Back Propagation algorithm for MLP network. [7]

Q3. (a) Suppose you are using an MLP for classification and have two applications: one with [3] [CO2, two classes and one with three classes. For each application, describe and justify CO4] particular choices for the error function and output activation function.

    (b) How is the hidden layer of an RBF network different from the hidden layer in an MLP? Explain this difference in terms of:

      i.   What the hidden nodes compute when feeding data to the network? [1]

      ii.   How the hidden nodes are trained? [1]

Q4. (a) Why it is impossible for a single binary perceptron to solve the XOR problem? [1] [CO2,

    (b) Show how RBF network can be used to solve XOR problem. [4] CO3]

Q5. (a) Prove that the expected maximum number of randomly assigned patterns that are [3] [CO1, linearly separable in a space of dimensionality M is equal to $2M$. CO2,

    (b) Describe the architecture of a Functional Link artificial neural network and explain [5] CO5] what is computed by each component of the network.