INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

End-Spring Semester 2022-23

Date of examination: 13.04.2023 **Session (*FN / AN*):** AN **Duration:** *1.5 hours+15min* **Full marks:** 20

Subject No.: AI42001 **Subject:** Machine Learning: Foundations and Applications (LAB)

Department/Center/School: Centre of Excellence in Artificial Intelligence (CoEAI)

Instructions: ***Implement the solution in Google colab notebook with appropriate comments on each block***

Consider a classification task involving a modified MNIST data (uploaded in MS Teams) having 1000 data items distributed across 10 classes. Each data is an image with 20x20 dimension, flattened to 400-dimension vector.

a. Implement Principal Component Analysis (PCA) to perform reduction of dimensionality to 100. Design a Multi-Layer Perceptron (MLP) classifier that takes as input the reduced vector and predicts its class. Report classification accuracy by performing 5-fold cross validation. Repeat the experiment with dimensionality reduced to 200.
b. Implement Linear Discriminant Analysis (LDA) to perform dimensionality reduction to 100. Use similar MLP classifier to classify the reduced data vector. Report classification accuracy by performing 5-fold cross validation. Repeat the experiment with dimensionality reduced to 200.

** You should not use any library implementation of PCA and LDA. However, you may use some linear algebra libraries, e.g., numpy.linalg to compute things like eigenvectors etc.

[10+10=20]