EEL 6825 Assignment #2

The objective of this assignment is to correctly classify 10 handwritten digits using a neural network. The assigment2.mat data set found on Blackboard contain training and testing data, both having the same format: The first column of the matrix is the label (0-9) and the remaining columns represent the intensities (range=[0:16]) of the pixels of the 8 x 8 digital images, arranged in a raster scan. Using this data, write ***original*** Matlab code to perform the following analyses:

a. Using the training data set, apply the delta rule to train a single perceptron having a tansigmoid activation function to output a 0.9 (1) if the input pattern is a written 2, and to output a -0.9 (-1) for all other written characters.
   i. Plot the error curve during training and report the final weights.
   ii. Test the network using the test data set and report the accuracy.

b. Using the training data set, apply backpropagation to train a three-layer MLP having a tansigmoid activation functions. The output should consist of 10 units, each corresponding to a digit. Each unit will output 0.9 (1) for its respective digit and -0.9 (-1) otherwise. The hidden layer should consist of 10 units.
   i. Plot the error curve during training and report the final weights.
   ii. Test the network using the test data set and report the accuracy.
   iii. Provide the confusion matrix.

c. Repeat part b using 5 and 15 hidden units.

d. Compare and discuss the results from each step.