Assignment 1 report

1)

Margin = 10
Epochs = 40

Accuracies:-
Simple perceptron = 99.89%
Simple perceptron with margin = 99.89%
Batch perceptron without margin = 99.79%
Batch perceptron with margin = 99.79%

2)
Margin = 10
Learning rate = 0.2
Epochs = 1000
Relaxation algorithm = 97.56
Modified perceptron = 97.22

Margin = 10
Learning rate = 0.5
Epochs = 200
Relaxation algorithm = 96.98
Modified perceptron = 96.88

Margin = 20
Learning rate = 0.5
Epochs = 1000
Relaxation algorithm = 97.36
Modified perceptron = 96.48

It was observed that increasing the learning rate decreases the number of epochs it takes to reach a steady minimum value. But it was at the cost of accuracy.
It was also observed that after a certain margin value (10 in this case), the accuracy falls.

4)
NN = 21
accuracy = 0.85046728972
confusion matrix =
[[3. 0. 0. 0. 0. 0. 0. 0. 0. 0.]
 [6. 10. 0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 8. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 9. 0. 0. 0. 0. 0. 0.]
 [1. 1. 0. 0. 13. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 9. 0. 0. 0. 0.]
 [0. 0. 2. 1. 0. 0. 9. 1. 1. 2.]
 [0. 0. 0. 0. 0. 0. 1. 13. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 12. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 5.]]

f1 score = 0.8381320395

NN = 11
accuracy = 0.878504672897
confusion matrix =
[[3. 0. 0. 0. 0. 0. 0. 0. 0. 0.]
 [6. 11. 0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 9. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 10. 0. 0. 0. 0. 0. 0.]
 [1. 0. 0. 0. 13. 0. 0. 0. 1. 0.]
 [0. 0. 0. 0. 0. 9. 0. 0. 0. 0.]
 [0. 0. 1. 0. 0. 0. 9. 1. 0. 2.]
 [0. 0. 0. 0. 0. 0. 1. 13. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 12. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 5.]]
f1 score = 0.862770605443

NN = 5
accuracy = 0.897196261682
confusion matrix =
[[4. 0. 0. 0. 0. 0. 0. 0. 0. 0.]
 [5. 11. 0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 9. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 9. 0. 0. 0. 0. 0. 0.]
 [1. 0. 0. 0. 13. 0. 0. 0. 1. 0.]
 [0. 0. 0. 0. 0. 9. 0. 0. 0. 0.]
 [0. 0. 1. 1. 0. 0. 10. 1. 0. 1.]
 [0. 0. 0. 0. 0. 0. 0. 13. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 12. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0. 0. 6.]]
f1 score = 0.888892487629

NN > 22 gives almost the same accuracy
NN < 5 gives worse results.

Thus, for this particular configuration, NN=5 is the best choice.