Assignment 1

2.b)

Model 1

The network structure can be summarized as follows:

1. Convolutional input layer, 32 feature maps with a size of 3×3, and a rectifier activation function.
2. Dropout value set to 20%.
3. Convolutional layer, 32 feature maps with a size of 3×3 with a rectifier activation function.
4. Max Pool layer with size 2×2.
5. Flatten layer.
6. Fully connected layer with 512 units and a rectifier activation function.
7. Dropout value set to 50%.
8. Fully connected output layer with 10 units and a softmax activation function.

Stochastic gradient descent optimization algorithm with a learning rate of 0.01. The model is fitted with 25 epochs and a batch size of 32.

Accuracy obtained is 71.10%

Model 2

A deep version of the simple CNN above is built by introducing an additional round of convolutions with many more feature maps. The pattern of Convolutional, Dropout, Convolutional and Max Pooling layers is still followed.
Hence it will be repeated 3 times with 32, 64, and 128 feature maps. As a result, there is an increasing number of feature maps with a smaller and smaller size given the max pooling layers. Lastly, an additional and larger Dense layer is used at the output end of the network to better transform the large number feature maps to class values.

The test accuracy obtained is 79.58%

Network Topology:

Convolutional input layer, 32 feature maps and a rectifier activation function.
Dropout layer at 20%.
Convolutional layer, 32 feature maps and a rectifier activation function.
Max Pool layer with size 2×2.
Convolutional layer, 64 feature maps and a rectifier activation function.
Dropout layer at 20%.
Convolutional layer, 64 feature maps and a rectifier activation function.
Max Pool layer with size 2×2.
Convolutional layer, 128 feature maps and a rectifier activation function.
Dropout layer at 20%.
Convolutional layer,128 feature maps and a rectifier activation function.
Max Pool layer with size 2×2.
Flatten layer.
Dropout layer (20%)
Fully connected layer with 1024 units and a Relu function.
Dropout layer at 20%.
Fully connected layer with 512 units and a Relu function.
Dropout layer at 20%.
Fully connected output layer with 10 units and a softmax activation function.

Model 3

Again, a deep version of CNN is built, this time using Advanced Activation Layer i.e. Leakyrelu. The pattern of Convolutional, Dropout, Convolutional and Max Pooling layers is still followed, but with different size of feature maps when compared to Model 2.

The test-accuracy is 73%.