**Assignment No: 1**

**Problem Statement:**

Develop a Feedforward Neural Network (FNN) in Python using Keras and TensorFlow.

**Theory:**

A Feedforward Neural Network (FNN) is a type of artificial neural network where information moves in one direction: from input nodes, through hidden layers, to output nodes. Unlike Recurrent Neural Networks, FNNs have no cycles or loops.

-Layers: FNNs consist of an input layer, one or more hidden layers, and an output layer.

-Activation Functions: Non-linear activation functions like ReLU, Sigmoid, and Softmax are used to help the network learn complex patterns by introducing non-linearity.

**Methodology:**

1. Data Preparation:

- Use a dataset such as MNIST, which contains 28x28 pixel grayscale images of handwritten digits.

- Preprocess the data by normalizing pixel values to the range [0, 1].

2. Model Architecture:

- Create an input layer based on the number of input features (e.g., 784 for 28x28 pixel images).

- Add one or more hidden layers, using the ReLU activation function for the neurons.

- Define the output layer based on the number of classes, using the Softmax activation function for classification tasks.

3. Implementation Using Keras:

- Use the Sequential API in Keras to build the feedforward neural network.

- Compile the model with an appropriate optimizer (such as Adam) and a loss function (like categorical\_crossentropy for multi-class classification).

4. Training and Evaluation:

- Train the model on the training dataset using the `fit()` function, and validate its performance using a separate test dataset.

- Evaluate the model's performance and accuracy using the `evaluate()` function.

**Conclusion:**

We successfully implemented a feedforward neural network using Keras and TensorFlow, achieving high accuracy on the MNIST handwritten digit classification task.