Practical 3

Aim: The aim of this practical is to introduce you to the fundamentals of TensorFlow, covering concepts such as tensors, data types, constants, graphs, variables, placeholders, and basic operations.

Problem Statement: In this practical, you will work with TensorFlow to understand its basic syntax and components, including tensors, data types, constants, graphs, variables, and placeholders.

Theory:

1. Tensors in TensorFlow: Learn about tensors, which are fundamental data structures in TensorFlow. Understand their static type, rank, and shape.
2. TensorFlow Data Types: Explore various data types in TensorFlow, including integers, floats, booleans, and strings. Learn how to cast between different data types.
3. TensorFlow Constants: Create constant tensors with specific values and data types using TensorFlow.
4. TensorFlow Variables: Understand how TensorFlow variables work and how they represent shared, persistent state that can be manipulated within your program.
5. Machine Learning Workflow with tf.keras: Explore the typical steps involved in a machine learning workflow using the tf.keras library. This includes data preparation, model definition, training configuration, and model training.
6. tf.keras Built-in Datasets: Learn about built-in datasets available in tf.keras, which can be used for training and testing deep neural network models.
7. Creating a tf.keras Model: Create a tf.keras model using the Sequential model type. Define the model's architecture and input dimensions.
8. Compiling a tf.keras Model: Configure the learning process of the model before training. This includes setting the optimizer, loss function, and evaluation metrics.
9. Training and Evaluating a tf.keras Model: Train the tf.keras model with input data and labels. Set hyperparameters such as the number of epochs and batch size. Use the evaluate function to assess the model's performance.
10. Making Predictions: After training, use the predict function to generate predictions for input samples. Also, learn how to save and load model weights.

Conclusion: In this practical, you've gained an understanding of the basic syntax and components of TensorFlow. You've learned about tensors, data types, constants, variables, and placeholders. Additionally, you've explored key concepts related to machine learning workflows using the tf.keras library, including data preparation, model creation, training, evaluation, and prediction. This knowledge serves as a foundation for further exploration and application of TensorFlow in machine learning and deep learning tasks.