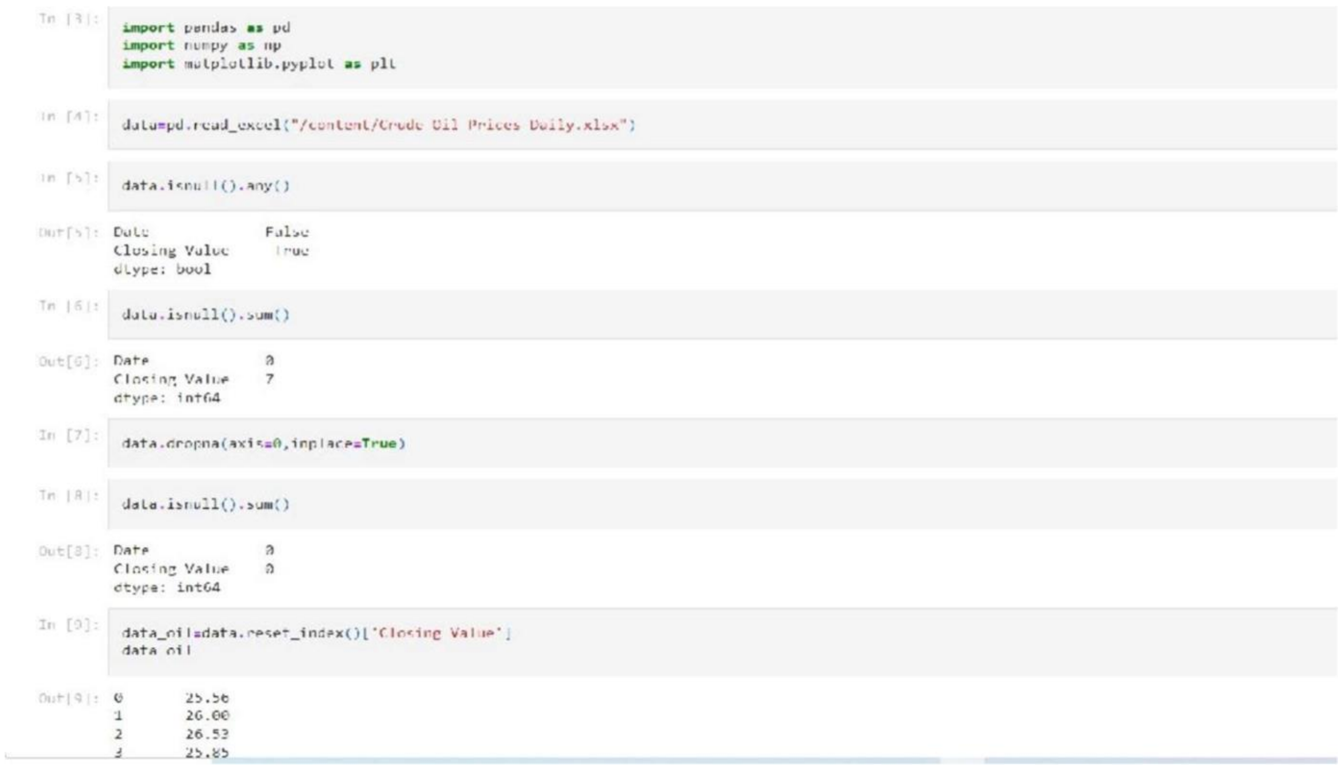
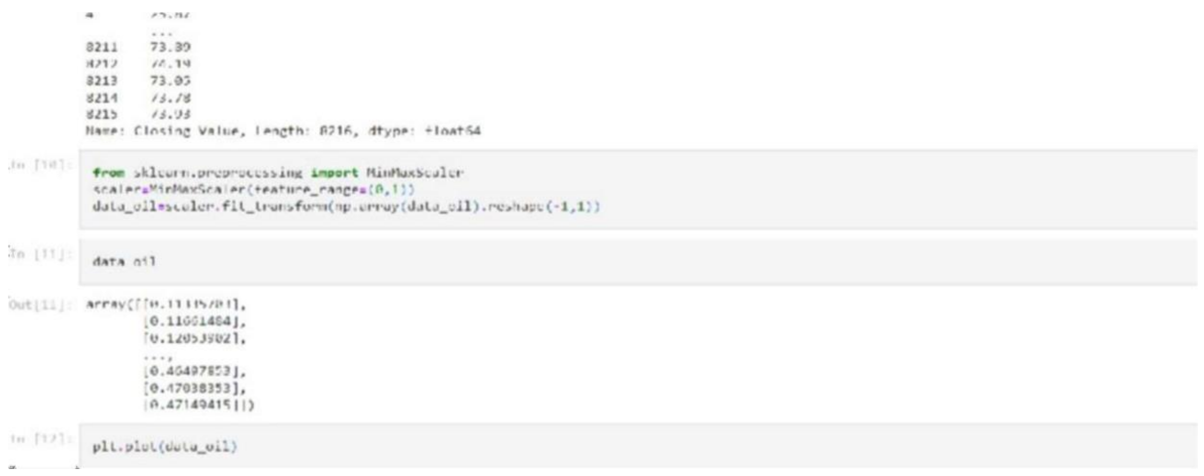
MODEL BUILDING- SAVE THE MODEL

Team ID	PNT2022TMID43576
Project Name	Crude Oil Price Prediction

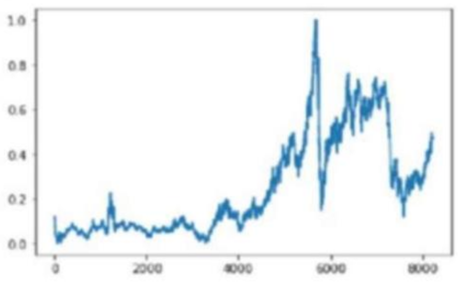


```
In [3]:  import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt

In [4]:  data=pd.read_excel("/content/Crude Oil Prices Daily.xlsx")

In [5]:  data.isnull().any()

Out[5]: Date             False
        Closing Value     True
        dtype: bool

In [6]:  data.isnull().sum()

Out[6]: Date             0
        Closing Value    7
        dtype: int64

In [7]:  data.dropna(axis=0,inplace=True)

In [8]:  data.isnull().sum()

Out[8]: Date             0
        Closing Value    0
        dtype: int64

In [9]:  data_oil=data.reset_index()['Closing Value']
         data_oil

Out[9]: 0       25.56
        1       26.00
        2       26.53
        3       25.85
```

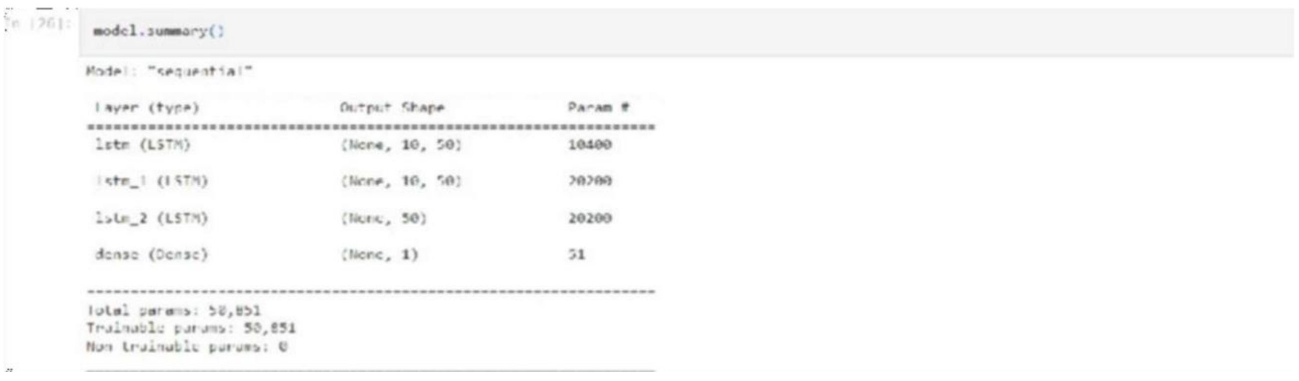


```
        4       [illegible]
                ...
        8211    73.89
        8212    74.19
        8213    73.05
        8214    73.78
        8215    73.93
        Name: Closing Value, Length: 8216, dtype: float64

In [10]: from sklearn.preprocessing import MinMaxScaler
         scaler=MinMaxScaler(feature_range=(0,1))
         data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))

In [11]: data_oil

Out[11]: array([[0.11115703],
                [0.11661484],
                [0.12053902],
                ...,
                [0.46497853],
                [0.47038353],
                [0.47149415]])

In [12]: plt.plot(data_oil)
```

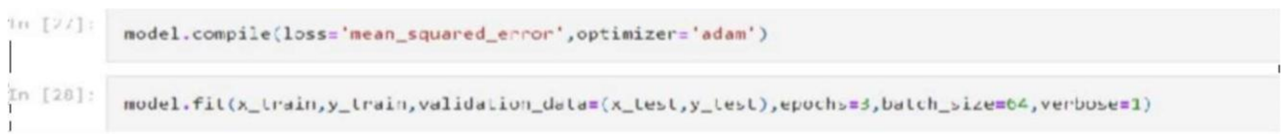
```
Out[12]: []
```



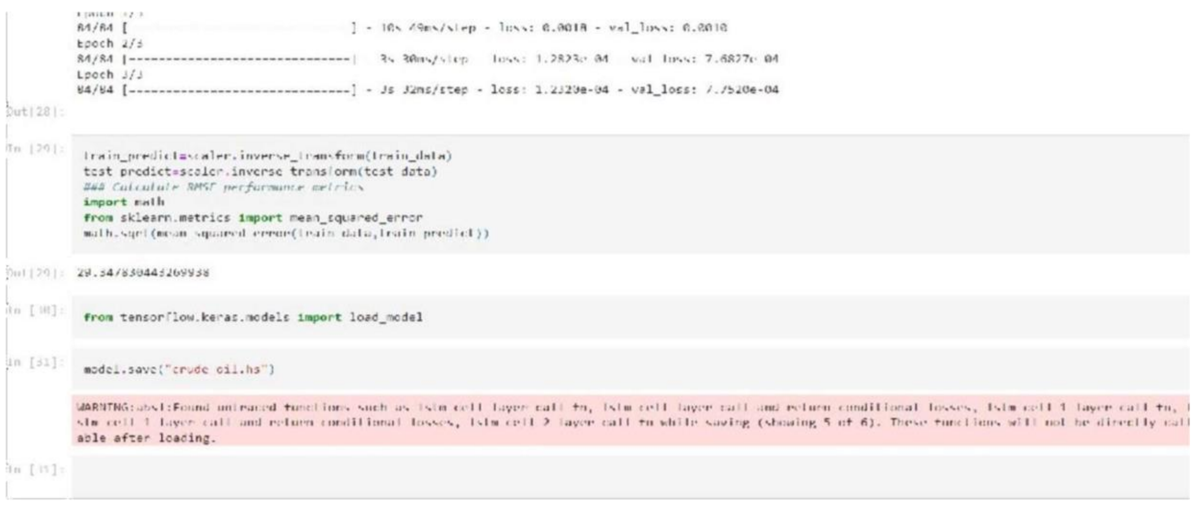
```
In [13]: training_size=int(len(data_oil)*0.65)
         test_size=len(data_oil)-training_size
         train_data,test_data=data_oil[0:training_size,:],data_oil[training_size:len(data_oil),:1]

In [14]: training_size,test_size

Out[14]: (5340, 2876)

Out[15]: (5340, 1)

In [16]: def create_dataset(dataset,time_step=1):
           dataX,dataY=[],[]
           for i in range(len(dataset)-time_step-1):
             a=dataset[i:(i+time_step),0]
             dataX.append(a)
             dataY.append(dataset[i+time_step,0])
           return np.array(dataX),np.array(dataY)

In [17]: time_step=10
         x_train,y_train=create_dataset(train_data,time_step)
         x_test,y_test=create_dataset(test_data,time_step)

In [18]: print(x_train.shape),print(y_train.shape)

         (5329, 10)
         (5329,)
Out[18]: (None, None)

In [19]: print(x_test.shape),print(y_test.shape)

         (2865, 10)
         (2865,)
Out[19]: (None, None)

In [20]: x_train

Out[20]: array([[0.11335703, 0.11661484, 0.12053902, ..., 0.10980305, 0.1089886 ,
                 0.11054346],
                [0.11661484, 0.12053902, 0.11550422, ..., 0.1089886 , 0.11054346,
                 0.10165852],
                [0.12053902, 0.11550422, 0.1156523 , ..., 0.11054346, 0.10165852,
                 0.09906708],
                ...,
                [0.36731823, 0.35176058, 0.36080261, ..., 0.36391234, 0.37042796,
                 0.37042796],
                [0.35176058, 0.36080261, 0.35354657, ..., 0.37042796, 0.37042796,
                 0.37879461],
                [0.36080261, 0.35354657, 0.35295424, ..., 0.37042796, 0.37879461,
                 0.37916482]])

In [21]: x_train=x_train.reshape(x_train.shape[0],x_train.shape[1],1)
         x_test=x_test.reshape(x_test.shape[0],x_test.shape[1],1)

In [22]: from tensorflow.keras.models import Sequential
         from tensorflow.keras.layers import Dense
         from tensorflow.keras.layers import LSTM

In [23]: model=Sequential()

In [24]: model.add(LSTM(50,return_sequences=True,input_shape=(10,1)))
         model.add(LSTM(50,return_sequences=True))
         model.add(LSTM(50))

In [25]: model.add(Dense(1))
```



```
In [26]: model.summary()

Model: "sequential"

 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 10, 50)            10400

 lstm_1 (LSTM)               (None, 10, 50)            20200

 lstm_2 (LSTM)               (None, 50)                20200

 dense (Dense)               (None, 1)                 51

=================================================================
Total params: 50,851
Trainable params: 50,851
Non trainable params: 0
_________________________________________________________________
```



```
In [27]: model.compile(loss='mean_squared_error',optimizer='adam')

In [28]: model.fit(x_train,y_train,validation_data=(x_test,y_test),epochs=3,batch_size=64,verbose=1)
```



```
Epoch 1/3
84/84 [==============================] - 10s 49ms/step - loss: 0.0018 - val_loss: 0.0010
Epoch 2/3
84/84 [==============================] - 3s 30ms/step - loss: 1.2823e-04 - val_loss: 7.6827e-04
Epoch 3/3
84/84 [==============================] - 3s 32ms/step - loss: 1.2329e-04 - val_loss: 7.7520e-04
Out[28]:

In [29]: train_predict=scaler.inverse_transform(train_data)
         test_predict=scaler.inverse_transform(test_data)
         ### Calculate RMSE performance metrics
         import math
         from sklearn.metrics import mean_squared_error
         math.sqrt(mean_squared_error(train_data,train_predict))

Out[29]: 29.347830443269938

In [30]: from tensorflow.keras.models import load_model

In [31]: model.save("crude oil.h5")

WARNING:absl:Found untraced functions such as lstm_cell_layer_call_fn, lstm_cell_layer_call_and_return_conditional_losses, lstm_cell_1_layer_call_fn, l
stm_cell_1_layer_call_and_return_conditional_losses, lstm_cell_2_layer_call_fn while saving (showing 5 of 6). These functions will not be directly call
able after loading.

In [ ]:
```