In [1]:
```
print("Abhay Ajith\nAM.EN.U4CSE19301")
```

```
Abhay Ajith
AM.EN.U4CSE19301
```

Python Packages

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from warnings import filterwarnings
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import LabelEncoder
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import MinMaxScaler
from keras.models import Sequential
from keras.layers import Dense, Dropout, LSTM
from fastai.tabular import add_datepart
```

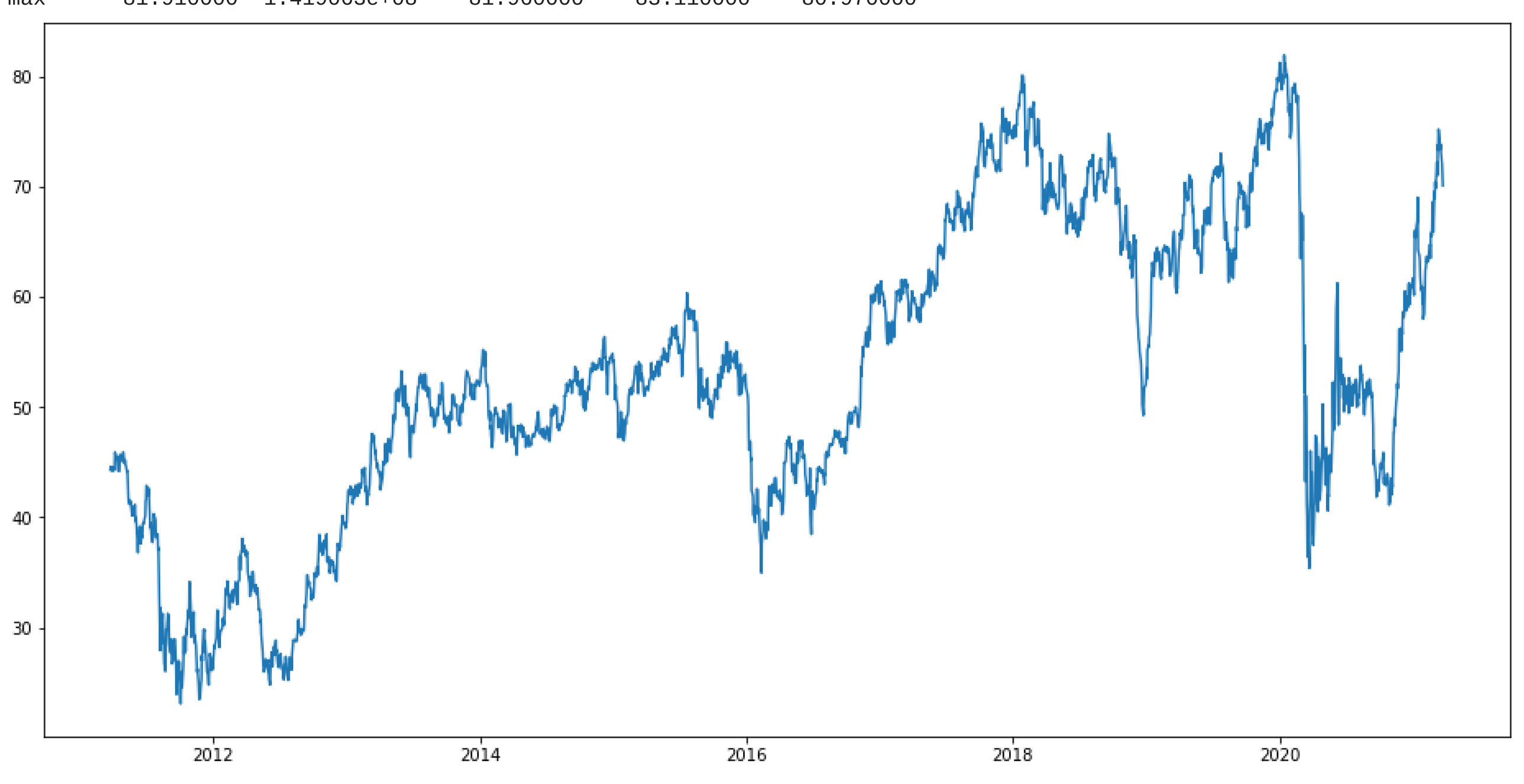
In [3]:
```
from ML_phase_1 import DataPreprocessing
from linear_regressor import LinearRegressor
from knn_regressor import KNNRegressor
from decision_tree_regressor import DecisionTreeRegression
from lstm import Lstm
```

Data Preprocessing(Phase-1)

In [4]:
```
filterwarnings('ignore')
```

In [5]:
```
filename = 'C.csv'
df = DataPreprocessing(filename)
df.ProcessData()
train1,test1 = df.CleanData()
df.Visualize()
```

```
------------------------------------Relevent Data------------------------------------
         Date  Close    Volume   Open     High     Low
0  03/24/2021  70.08  17089620  71.69  72.4800  70.060
1  03/23/2021  70.91  16238700  71.30  72.6400  70.505
2  03/22/2021  71.96  15039980  72.29  72.6000  71.640
3  03/19/2021  73.01  24079440  73.20  73.5802  71.522
4  03/18/2021  73.84  23857890  74.43  76.1300  73.450
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2516 entries, 0 to 2515
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Date    2516 non-null   object
 1   Close   2516 non-null   float64
 2   Volume  2516 non-null   int64
 3   Open    2516 non-null   float64
 4   High    2516 non-null   float64
 5   Low     2516 non-null   float64
dtypes: float64(4), int64(1), object(1)
memory usage: 118.1+ KB
None
             Close        Volume         Open         High          Low
count  2516.000000  2.516000e+03  2516.000000  2516.000000  2516.000000
mean     52.856709  2.447535e+07    52.871758    53.434894    52.288577
std      13.493481  1.461898e+07    13.491746    13.530430    13.467422
min      23.110000  4.576212e+06    22.560000    24.100000    21.400000
25%      44.300000  1.461642e+07    44.335000    44.800000    43.825000
50%      51.705000  2.018594e+07    51.710000    52.230000    51.095000
75%      63.990000  2.966006e+07    64.012500    64.642500    63.350000
max      81.910000  1.419063e+08    81.960000    83.110000    80.970000
```



Linear Regression using sklearn

In [6]:
```
test_A = LinearRegressor(train1,test1)
linear_reg_predA = test_A.predict()
test_A.Visualize(linear_reg_predA)
```

LSTM

In [7]:
```
lstm = Lstm(filename)
db,dataset = lstm.CleanData()
lstm_preds = lstm.predict(db)
```

```
1740/1740 - 27s - loss: 0.0018 - 27s/epoch - 16ms/step
```

In [8]:
```
lstm.Visualize(db,lstm_preds)
```

In [9]:
```
alpha =0.0000002
theta = np.zeros((14,1))
```

In [10]:
```
test1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 716 entries, 2018-05-21 to 2021-03-24
Data columns (total 15 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Close             716 non-null    float64
 1   Year              716 non-null    int64
 2   Month             716 non-null    int64
 3   Week              716 non-null    int64
 4   Day               716 non-null    int64
 5   Dayofweek         716 non-null    int64
 6   Dayofyear         716 non-null    int64
 7   Is_month_end      716 non-null    bool
 8   Is_month_start    716 non-null    bool
 9   Is_quarter_end    716 non-null    bool
 10  Is_quarter_start  716 non-null    bool
 11  Is_year_end       716 non-null    bool
 12  Is_year_start     716 non-null    bool
 13  mon_fri           716 non-null    int64
 14  Predictions       716 non-null    float64
dtypes: bool(6), float64(2), int64(7)
memory usage: 60.1 KB
```

KNN

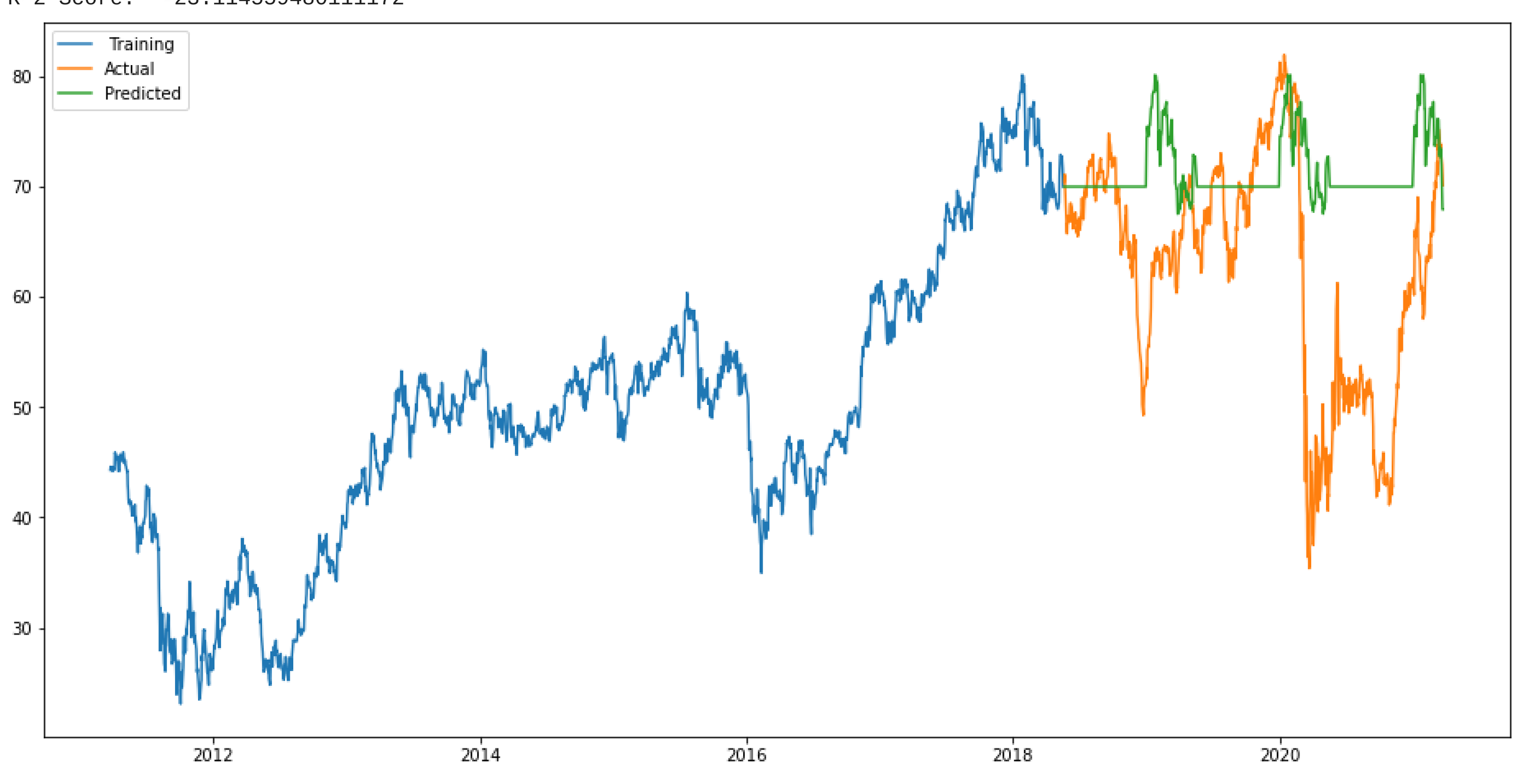
In [11]:
```
knn   = KNNRegressor()
preds = knn.predict(train1,test1)
knn.Visualize(preds,train1,test1)
```

```
Root Mean Square:  16.18054345039365
R^2 Score:  -70.95185333457661
```

DecisionTree

In [12]:
```
dt    = DecisionTreeRegression()
preds = dt.predict(train1,test1)
dt.Visualize(preds,train1,test1)
```

```
Root Mean Square:  13.510217393600529
R^2 Score:  -23.114559480111172
```



Linear Regression

In [13]:
```
train = train1
test = test1.drop('Predictions',axis = 1)
```

In [14]:
```
x_train = train.drop('Close', axis=1)
y_train = train['Close']
x_test = test.drop('Close', axis=1)
y_test = test['Close']
```

In [15]:
```
encoder = LabelEncoder()
def convert(dataset,column):
  dataset[column] = encoder.fit_transform(dataset[column])
convert(x_train,'Is_month_end')
convert(x_train,'Is_month_start')
convert(x_train,'Is_quarter_end')
convert(x_train,'Is_quarter_start')
convert(x_train,'Is_year_end')
convert(x_train,'Is_year_start')
```

In [16]:
```
alpha =0.0000002
m = len(x_train)
theta = np.zeros((14,1))
```

In [17]:
```
x_train = np.array(x_train)
y_train = np.array(y_train)
y_train = y_train.reshape((len(y_train),1))
x_train = np.append(np.ones((len(x_train),1)),x_train,axis = 1)
```

In [18]:
```
def cost_function(x,y,theta):
  y_pred = np.dot(x,theta)
  error = (y_pred-y)**2
  cost = 1/(2*m)*np.sum(error)
  return cost
```

In [19]:
```
def gradient_descent(x,y,theta,alpha,epochs = 1500):
  costs = []

  for i in range(0,epochs):
    y_pred = np.dot(x,theta)
    D = np.dot(x.transpose(),(y_pred-y))/m
    theta -= alpha*D
    costs.append(cost_function(x,y,theta))
  return costs,theta
```

In [20]:
```
costs,theta = gradient_descent(x_train,y_train,theta,0.0000002,1500)
```

In [21]:
```
y_pred = np.dot(np.append(np.ones((len(x_test),1)),x_test,axis = 1),theta)
```

In [22]:
```
test['Predictions'] = y_pred
plt.figure(figsize= (16,8))
plt.plot(train['Close'])
plt.plot(test[['Close','Predictions']])
```

Out[22]:
```
[<matplotlib.lines.Line2D at 0x22600455c40>,
 <matplotlib.lines.Line2D at 0x22600455f70>]
```