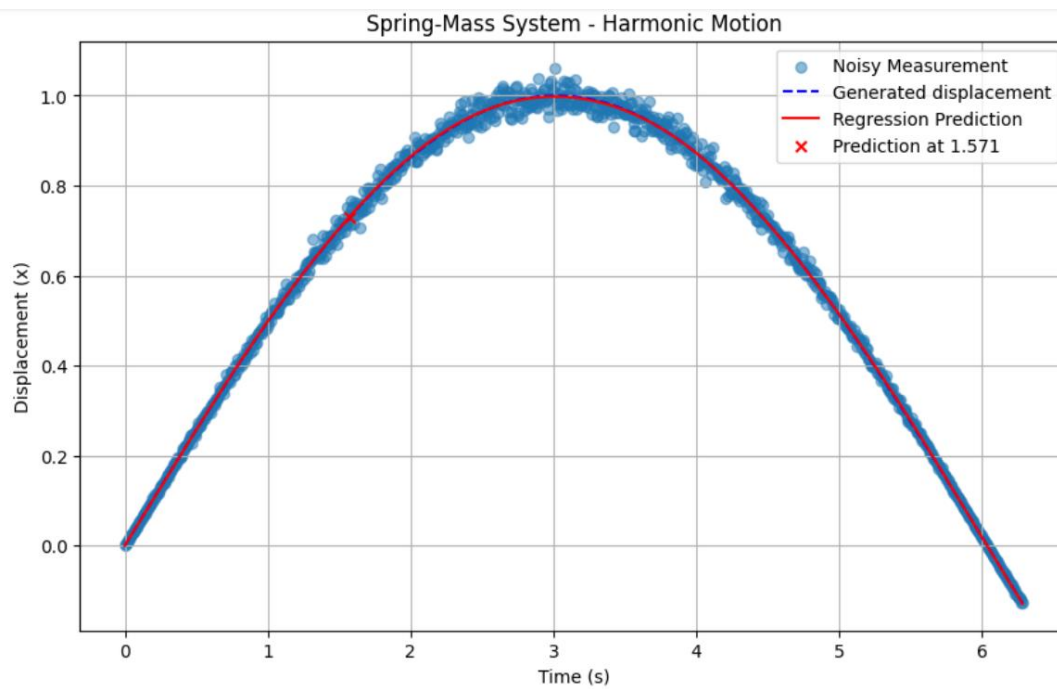# DEEP LEARNING PROJECT REPORT

Name- Spandan Seth

Entry Number-2022meb1348

ASSIGNMENT 2

Q1 Plotting the predicted values against the analytical solution.
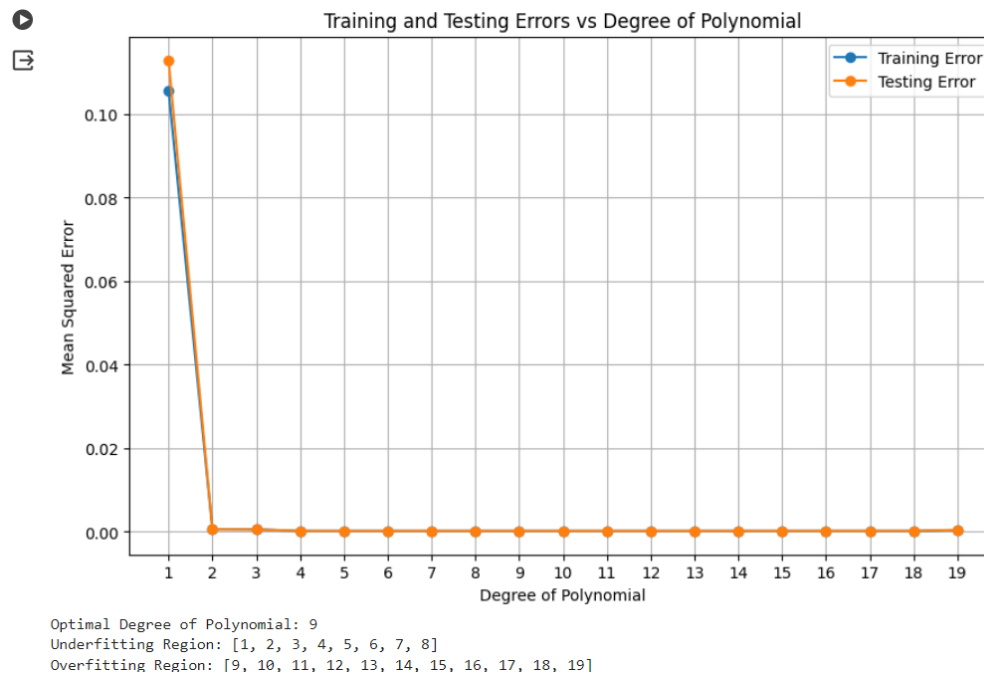


```
#constants
k = 13        #Stiffness
m = 48        #Mass
damping = 0.1   #damping coefficient
error = 5  #Measurement error percentage
degree =14
```
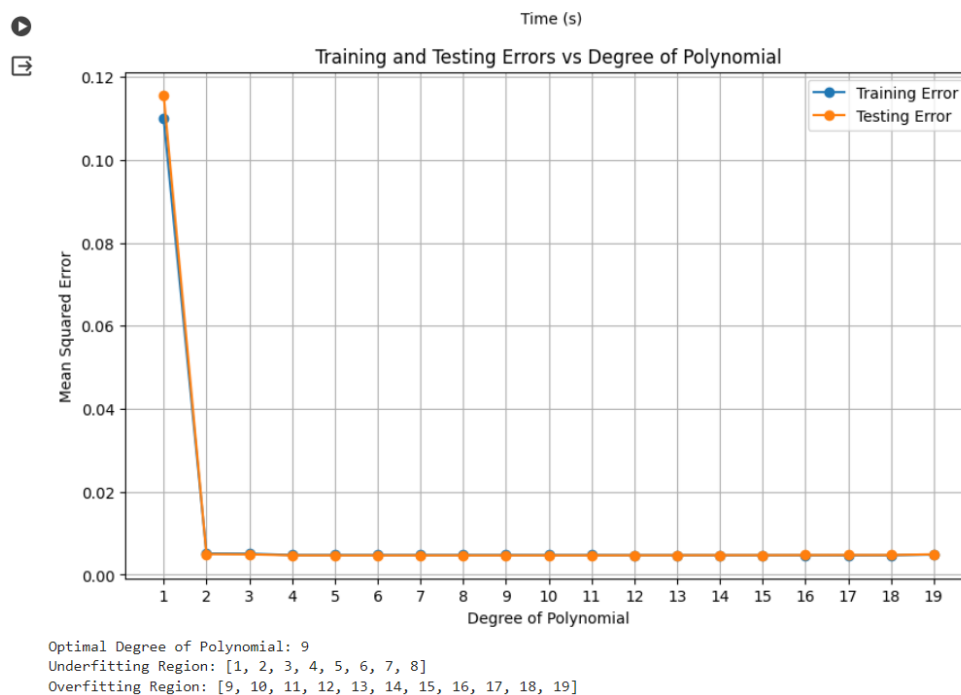
Q2 Plot the training and testing error with respect to the degree of polynomial. From this plot identify the optimal degree of polynomial, underfitting region and over fitting region.

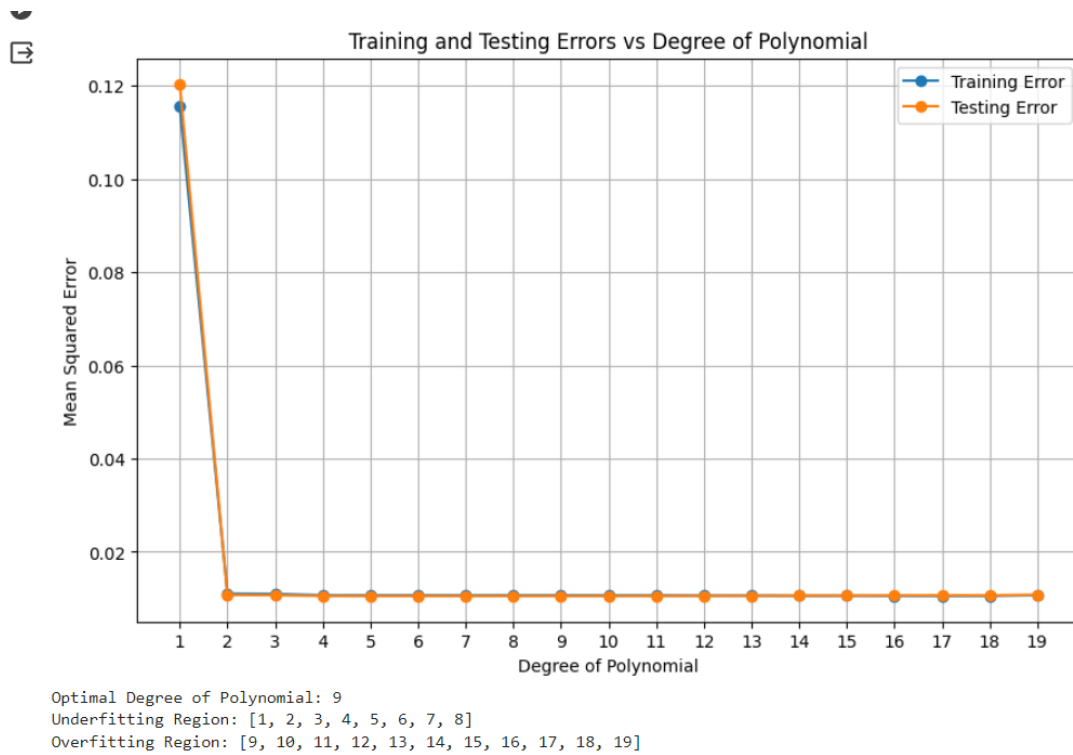three different level of noise.

1. For Noise =5%

Training and Testing Errors vs Degree of Polynomial

```
Optimal Degree of Polynomial: 9
Underfitting Region: [1, 2, 3, 4, 5, 6, 7, 8]
Overfitting Region: [9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]
```

2. For Noise=10 %

Training and Testing Errors vs Degree of Polynomial

```
Optimal Degree of Polynomial: 9
Underfitting Region: [1, 2, 3, 4, 5, 6, 7, 8]
Overfitting Region: [9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]
```

3. For Noise=15%

Training and Testing Errors vs Degree of Polynomial

Optimal Degree of Polynomial: 9
Underfitting Region: [1, 2, 3, 4, 5, 6, 7, 8]
Overfitting Region: [9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]

As we can see there is no change in Underfitting region or Overfitting region thus we conclude that These regions are independent of the noise changes
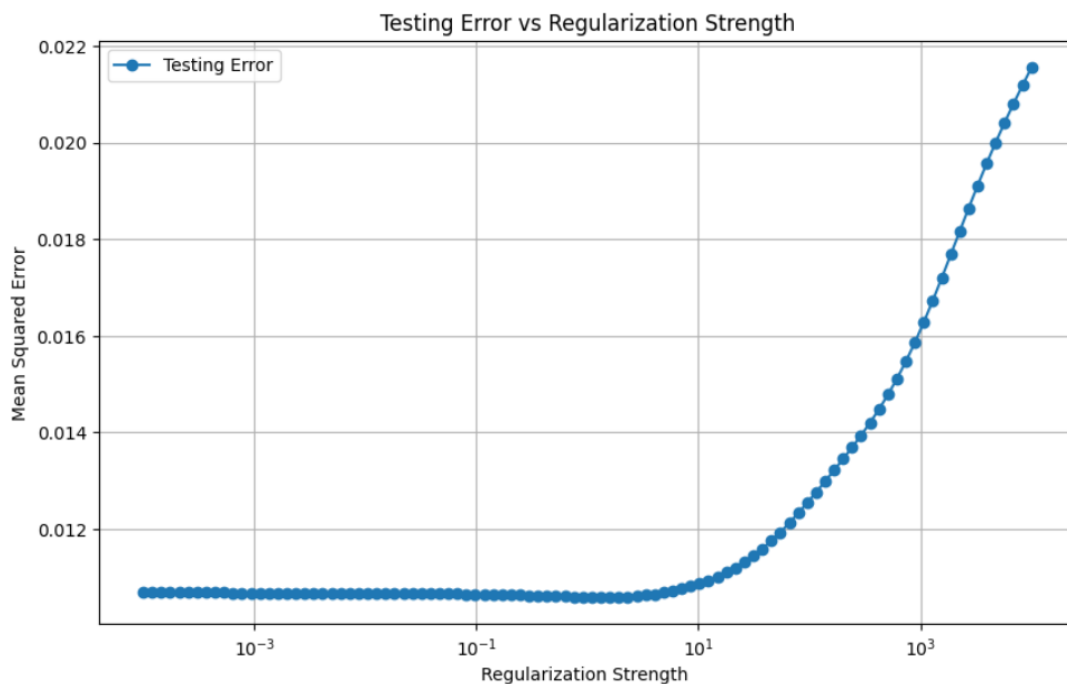
Q3 Increasing the data size in the geometric progression of two, and plot the training as well as testing error with respect to the data size.

Ans. Noise 15%

Degree Taken = 18

Q4 L2 regularization to find optimal value of Regularization strengt

Optimal Regularization Strength (λ): 1.3219411484660315