Name: Udandarao Sai Sandeep
Roll Number: 180123063
Dept.: Mathematics and Computing

Q1.
Using the method provided in the assignment, an estimate of μ and σ have been obtained using the data of the stock prices. The estimated values of mean and variance are as follows:

```
E(u) =  4.986838966067788e-05
Estimated value of mean is :  0.0002981060700200034
Estimated value of variance is :  0.000496475360718651
```

1000 values from the Normal Distribution have been generated for each date using the Box Muller Method. The starting date has been set to 30 Sep 2020. (Initial Stock Price is the Stock Price on 30 Sep 2020). Using the simulation formula (to directly calculate the stock price on a given day, not day by day), 1000 values of simulated stock price was calculated for each case.
Simulation Formula used:

$$S(t_{i+1}) = S(t_i) \exp\left(\left(\mu - \tfrac{1}{2}\sigma^2\right)(t_{i+1} - t_i) + \sigma\sqrt{t_{i+1} - t_i}\, Z_{i+1} \right)$$

$(t_{i+1} - t_i)$ represents the number of working days between 30 Sep 2020, and the given date for each case.

The Average of the 1000 values (Estimated Value) is as follows:

```
Estimated Value of stock price on 7 October 2020 is 181.89649965590948
Actual Value of stock price on 7 October 2020 is 190.7
Estimated Value of stock price on 14 October 2020 is 184.4311652123044
Actual Value of stock price on 14 October 2020 is 200.05
Estimated Value of stock price on 21 October 2020 is 200.82495384371737
Actual Value of stock price on 21 October 2020 is 203.75
```

Table is as follows:

Date	Simulated Value	Actual Value	$(t_{i+1} - t_i)$
7-OCT	181.89	190.7	4
14-OCT	184.43	200.05	10
21-OCT	200.82	203.75	15

Q2.
The percentatge error for each case has been calculated using the below formula:
Percentage Error = |(Simulated Value – Actual Value)*(100)|/(Actual Value)

Date	Simulated Value	Actual Value	Percentage Error
7-OCT	181.89	190.7	4.616%
14-OCT	184.43	200.05	7.807%
21-OCT	200.82	203.75	1.435%