**Exercise 1: Bayesian Model Updating: SDOF**

Consider a SDOF mass-spring system. The value of the mass is known and is equal to 1 kg.

The value of the spring stiffness is unknow and based on the experience and judgement the following is assumed.

A1. Value of stiffness is in the following range [0.5, 1.5] N/m.

A2. Value of stiffness follow a normal distribution with MPV equal to 0.9 N/m and standard deviation equal to 1 N/m.

To have a more accurate estimate of the value of the stiffness an experiment is performed where in the natural frequency of the system is observed. The following observation are made:

Observation 1 Freq = 1.021 rad/sec

Observation 2 Freq = 1.015 rad/sec

Observation 3 Freq = 0.994 rad/sec

Observation 4 Freq = 1.005 rad/sec

Observation 5 Freq = 0.989 rad/sec

Exercise:

1. Based on the information provided write the functional form of prior PDF with A1 alone, with A2 alone, and with A1 and A2 both.
2. Plot the prior function with A1 alone, with A2 alone, and with A1 and A2 both.
3. Based on the information provided write the functional form of likelihood with different number of observations. Assume the errors are independently distributed following normal distribution with zero mean and unit standard deviation.
4. Plot the likelihood function with different number of observations.
5. Based on the information provided write the functional form of the posterior PDF based on A1 alone and with different number of observations.
6. Plot the posterior distribution based on A1 alone and with different number of observations.
7. Based on the information provided write the functional form of the posterior PDF based on A2 alone and with different number of observations.
8. Plot the posterior distribution based on A2 alone and with different number of observations.
9. Based on the information provided write the functional form of the posterior PDF based on A1 and A2 both and with different number of observations.
10. Plot the posterior distribution based on A1 and A2 both and with different number of observations.