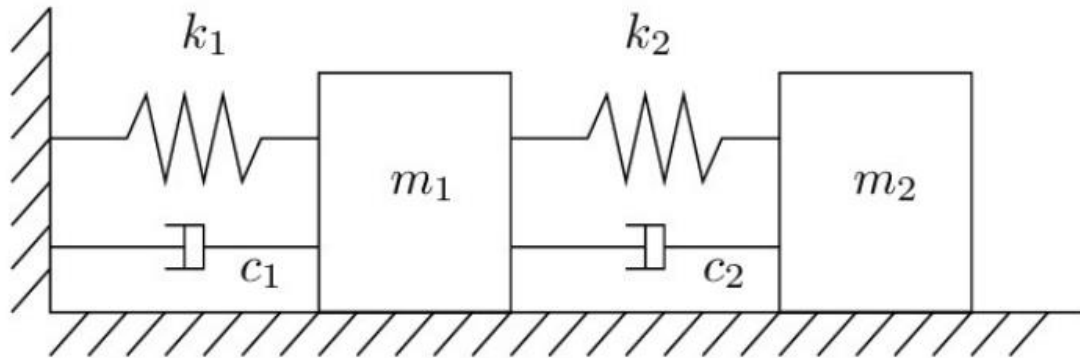


Question – 1:



Considering the displacement of mass m_1 is $+x_1$ and displacement of mass m_2 is $+x_2$ along the right side and $-x_1$ and $-x_2$ along the left side.

The following equations has been derived for position and velocities:

Freebody equation for mass m_1 :

$$m_1 \cdot x_1'' = k_2 (x_2 - x_1) + c_1 (x_2' - x_1') - k_1 x_1 - k_2 x_2$$

Freebody equation for mass m_2 :

$$m_2 \cdot x_2'' = -k_2 (x_2 - x_1) - c_1 (x_2' - x_1')$$

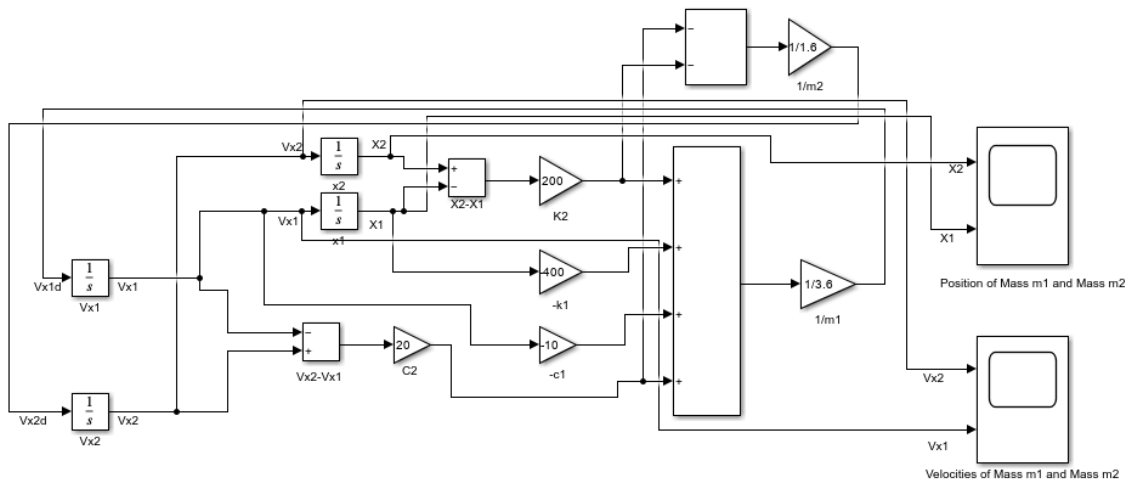
Where m_1 and m_2 are masses of the blocks in Kg's

c_1 and k_2 are Spring stiffness coefficients in N/m

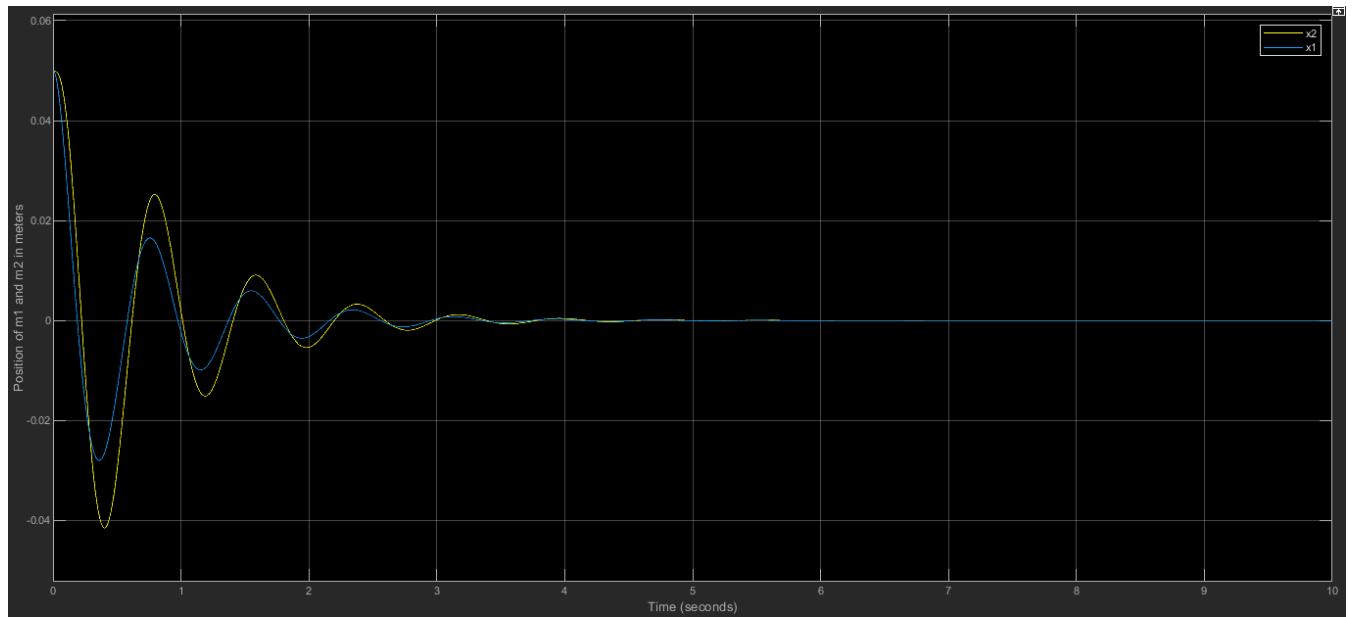
c_1 and c_2 are Damping coefficients in N.S/m

x_{0_1} and x_{0_2} are spring initial conditions

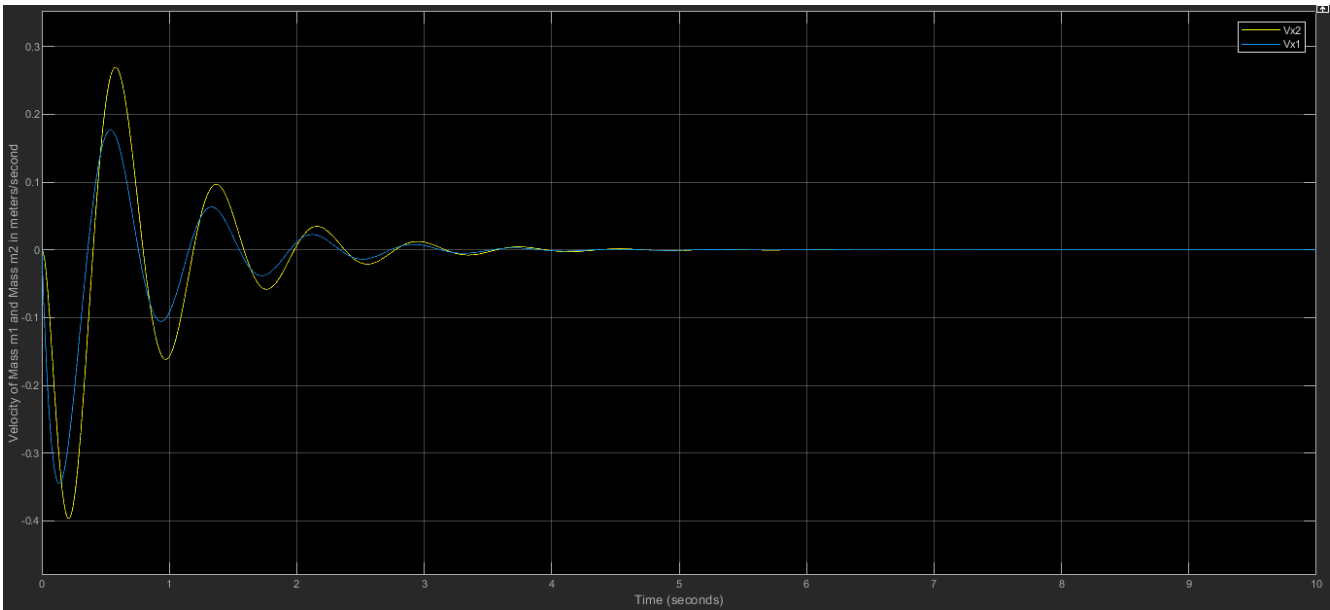
Positions and Velocity Graphs for Double mass system using Simulink, Simscape1D and Simscape3D



Simulink
Position
plot

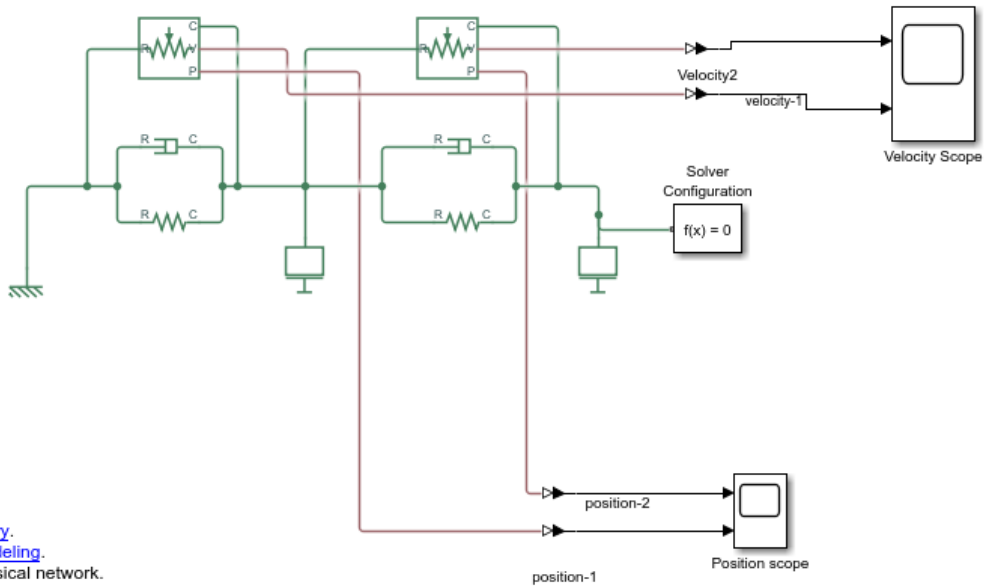


Simulink
Velocity
plot



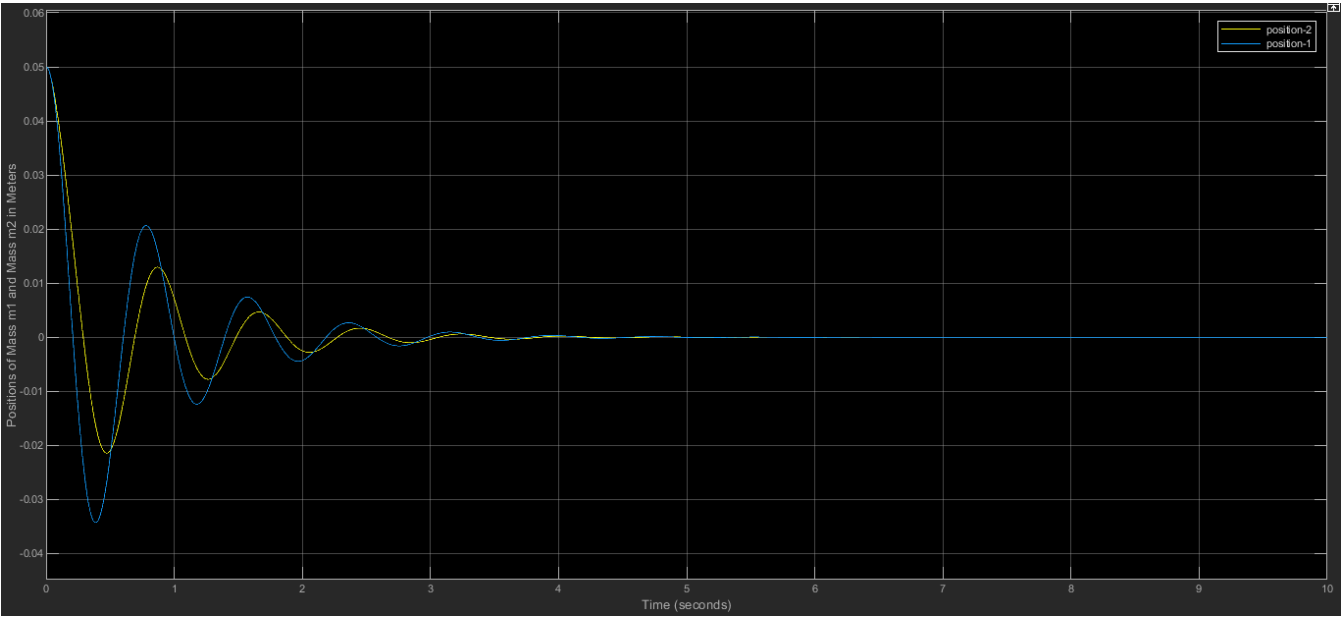
PS

[Simscape library.](#)
[Physical Modeling.](#)
in a physical network.
[Initial Steps for Constructing a Physical Model.](#)
[Simscape Results Explorer](#)



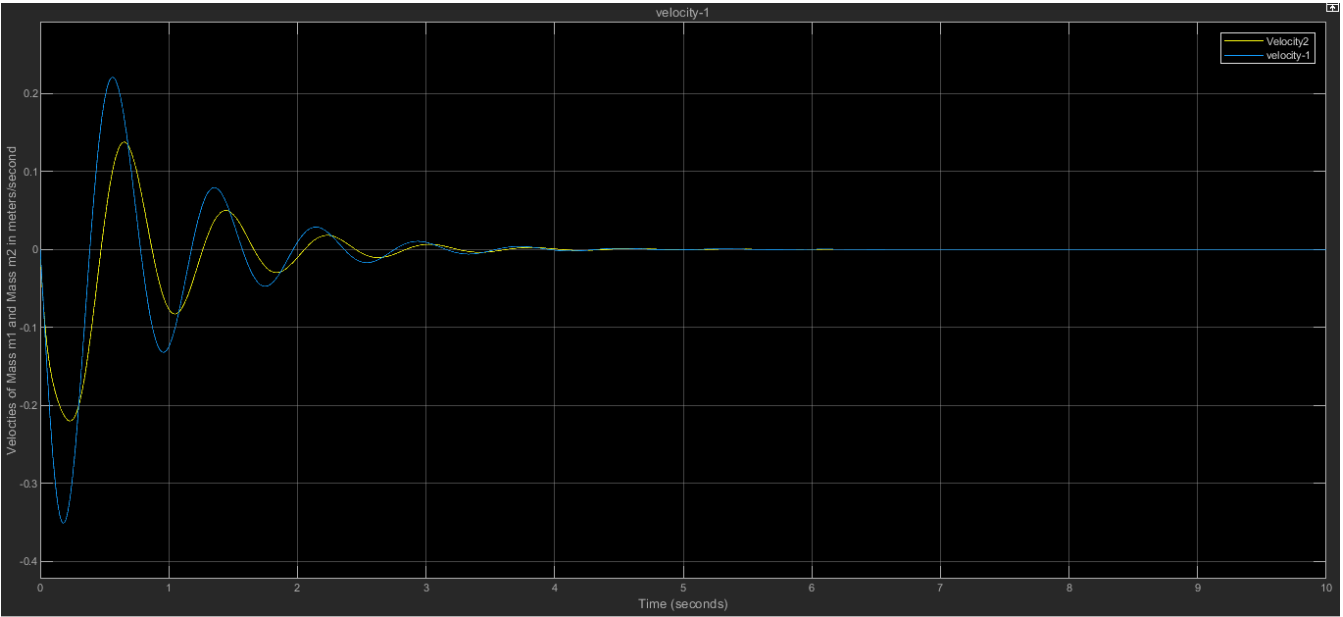
Simscape1D

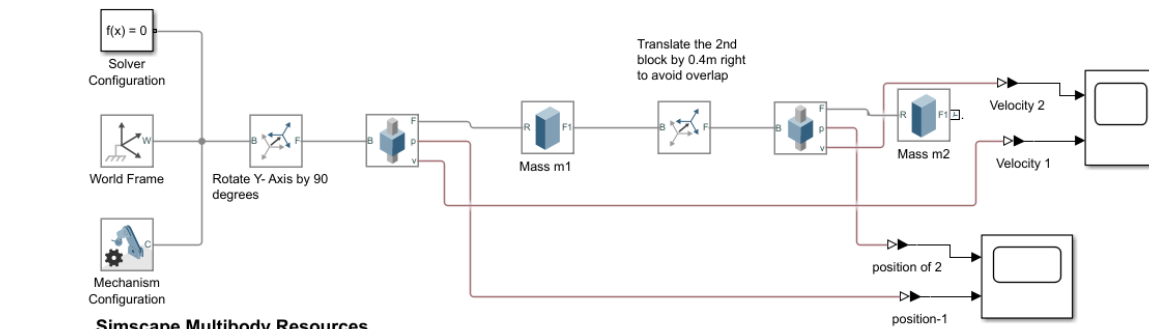
Position
plot



Simscape1D

Velocity
plot

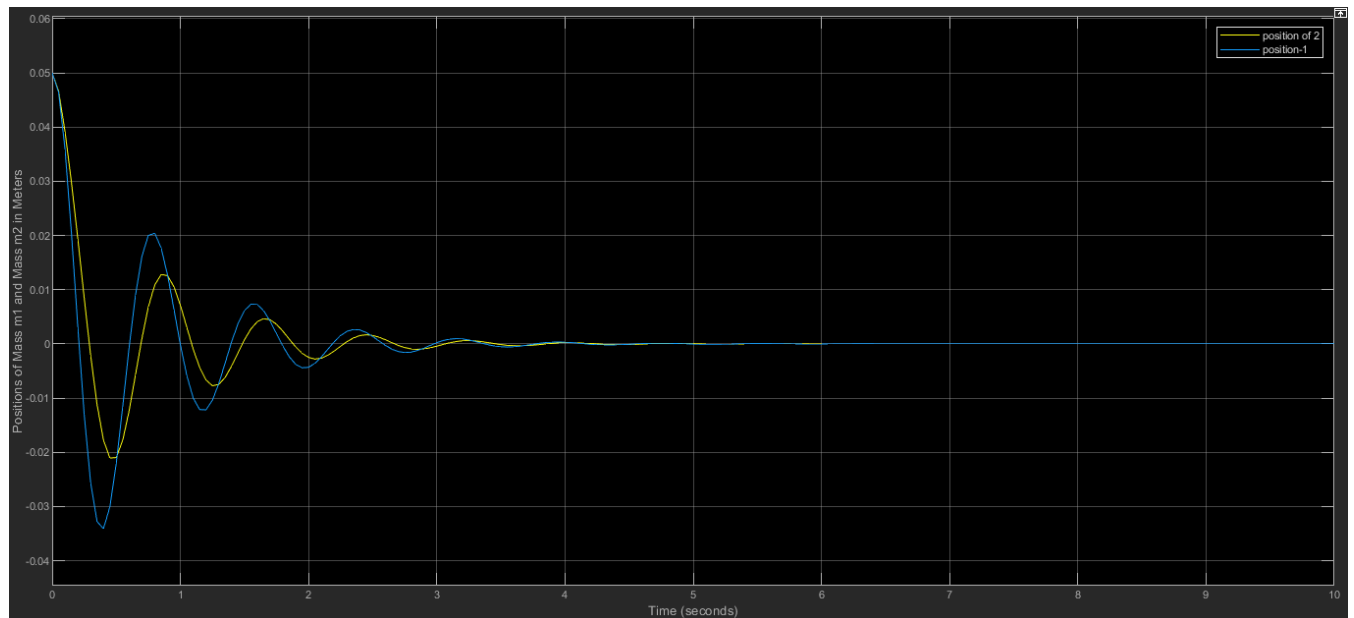




Simscape Multibody Resources

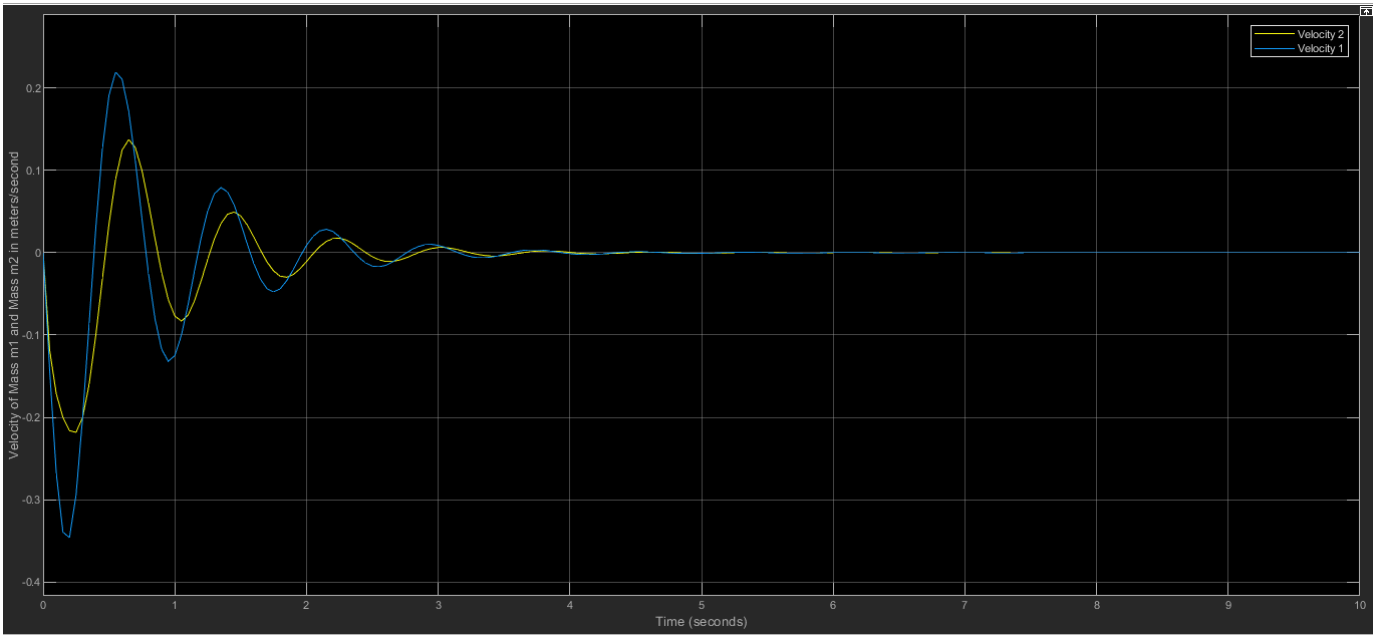
1. Find more multibody components in the [Simscape Multibody library](#).
2. Find components from other domains in the [Simscape library](#).
3. Connect the components to form a physical network.

Simscape3D
position plot

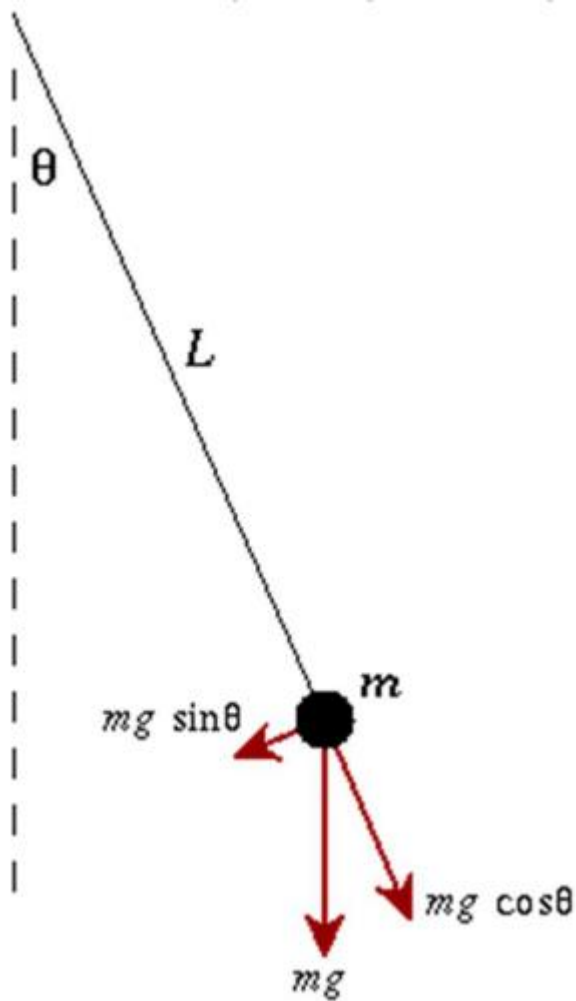


Simscape3D

Velocity
plot



Question 2:



Given Parameters are as follows

mass = 1 => mass of ball (kg)

c = 1 => damping coefficient (N*m/(rad/s))

l = 1 => length of string (m)

theta_0 = 10 => initial angular deformation (degree)

Equation for Simple pendulum with damping due to air resistance:

$$m.\theta'' = -c\theta' - m\frac{g}{l}\sin(\theta)$$

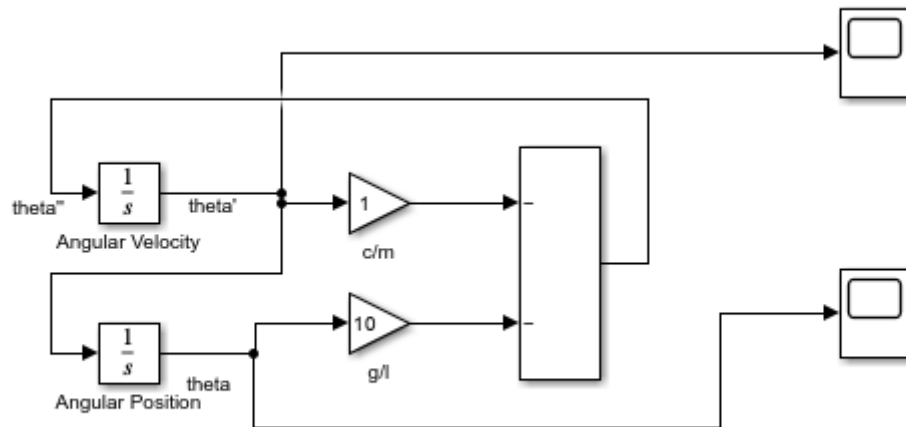
where, m represents mass of ball in k.g

c = Damping coefficient N*m/(rad/s))

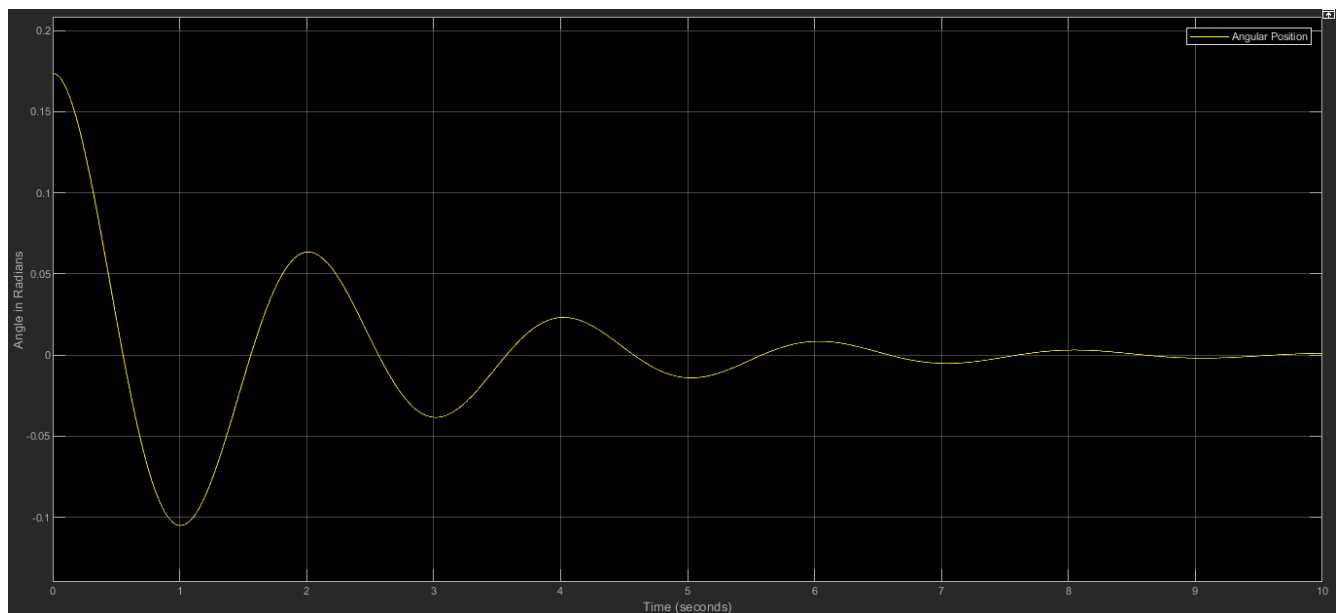
l = length of spring in m

θ = initial angular deformation in degrees

Angular positions and Angular velocity plot in Simulink, simscape1D and Simscape3D are Tabulated below:



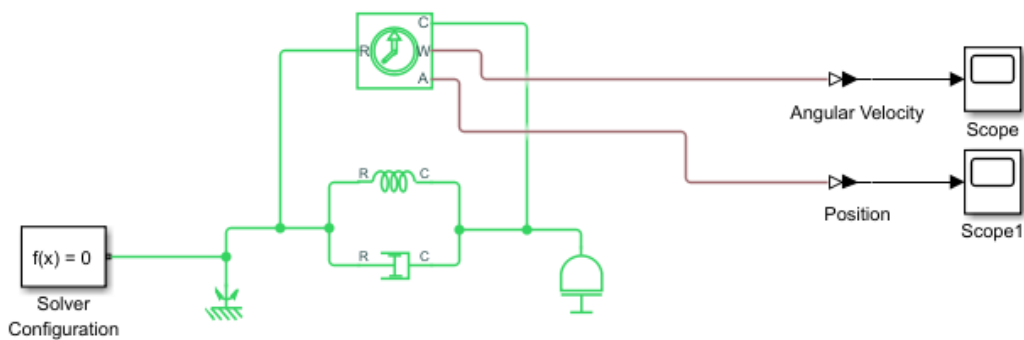
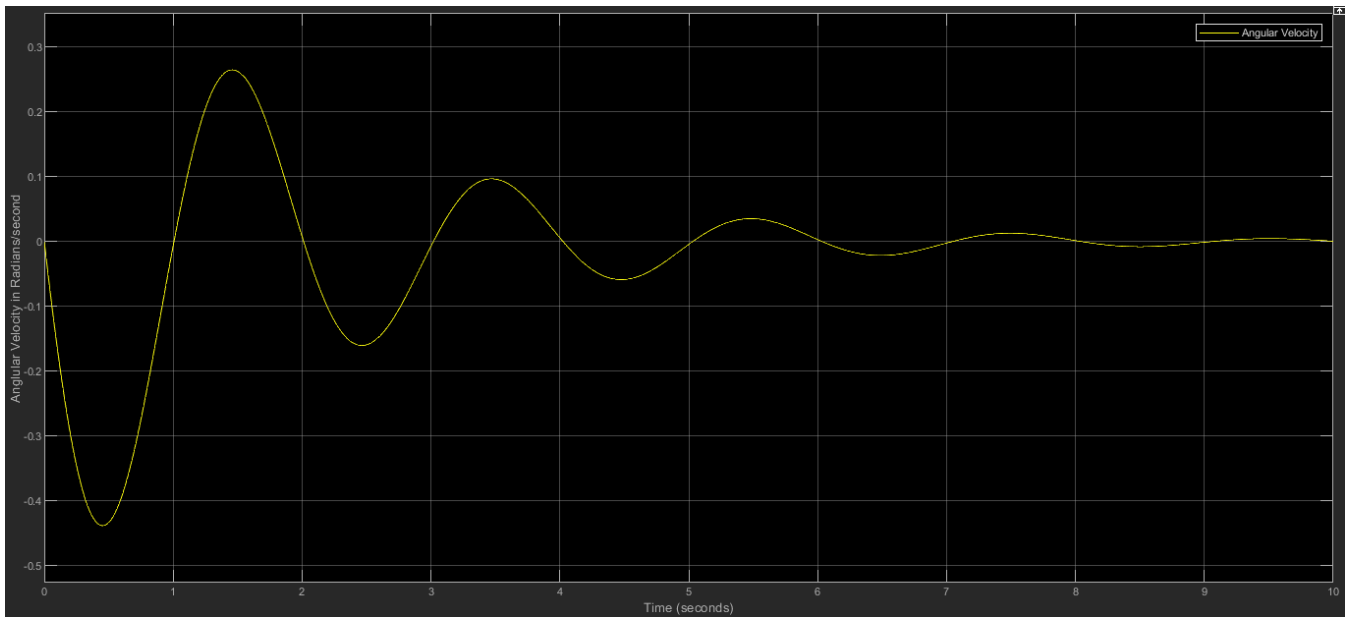
Simulink
Angular
Position plot



Simulink

Angular

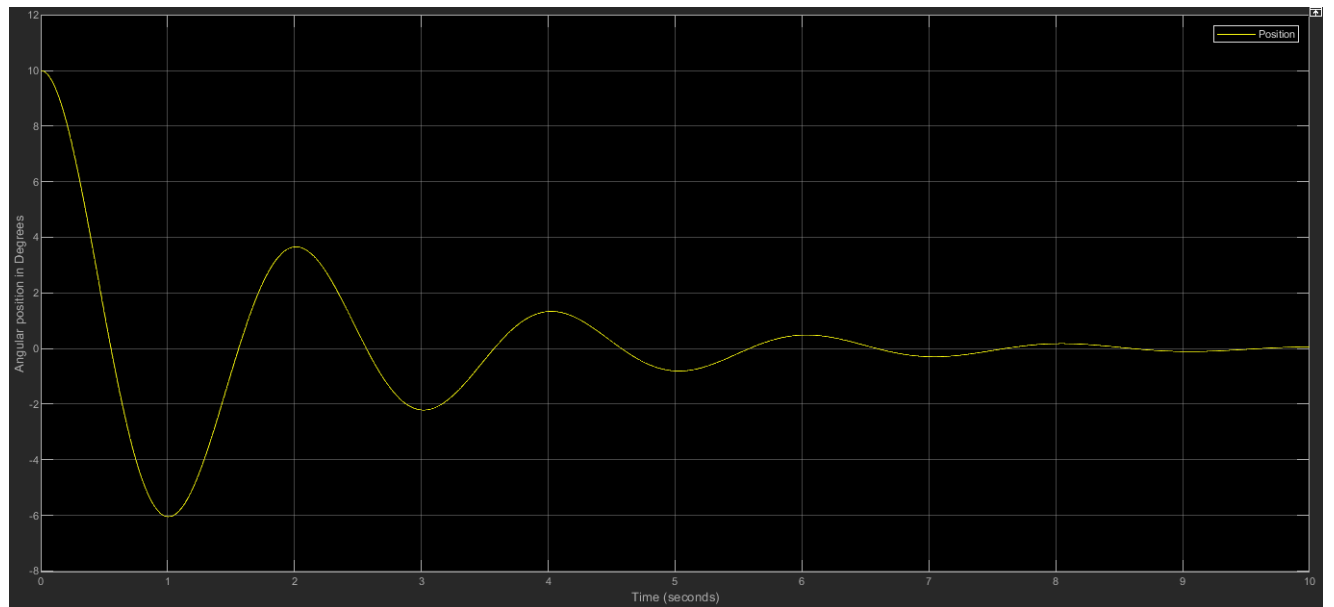
Velocity plot



Simscape1D

Angular

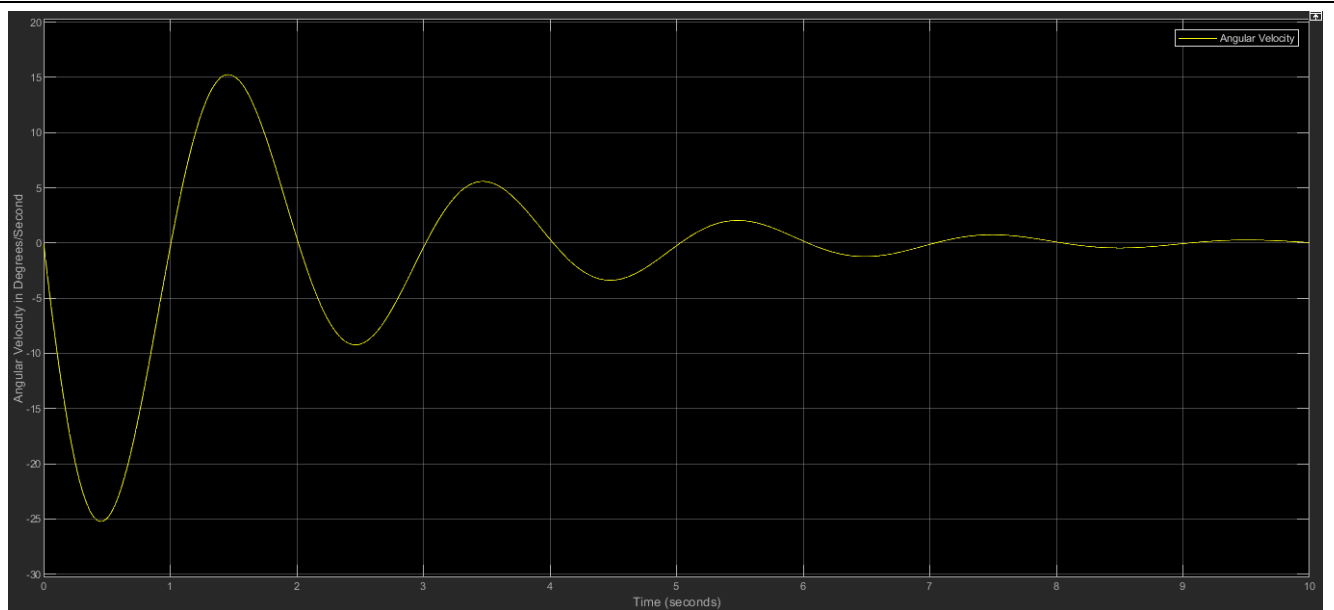
Position plot



Simscape1D

Angular

Velocity plot



Simscape3D

Angular

Velocity plot

