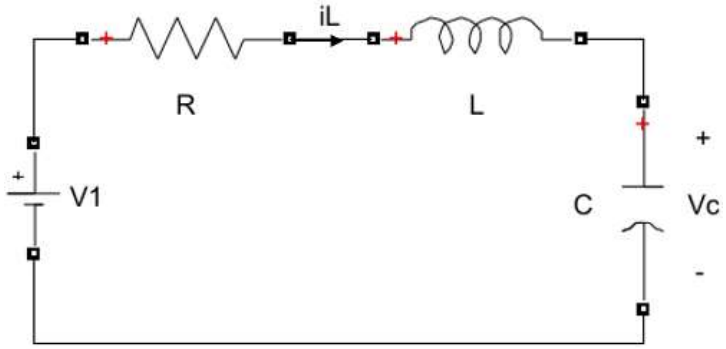
Experiment No. 10

Time Response from State Model of a System

AIM:

Using a suitable simulation package, develop a state model for the given Electrical Network and obtain the time response from the state model of a system.



Where, $L = 10H$, $C = 0.2\ F$ and $R = 6\Omega$

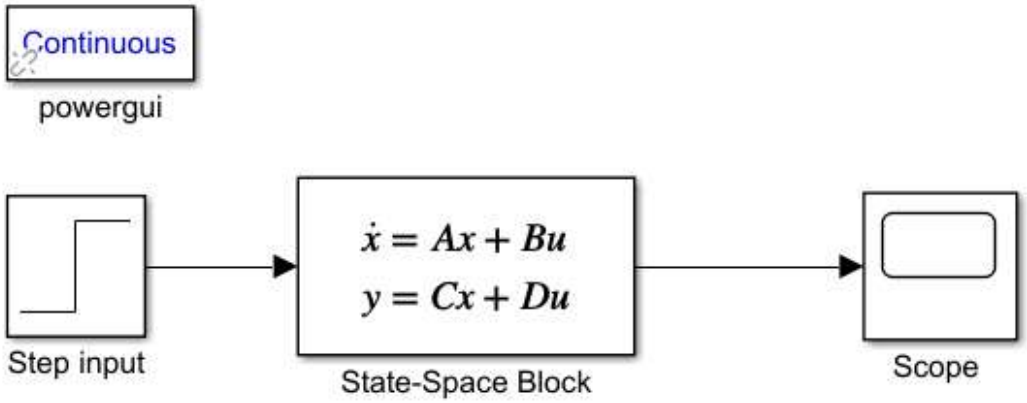
THEORY:

For the circuit given the state equations are:

$$[\dot{X}_1\ \dot{X}_2\ ] = [0\ 1/C\ -1/L\ -R/L\ ][X_1\ X_2\ ] + [0\ 1/L\ ][u]$$

$$y = [0\ 1\ ][X_1(t)\ X_2(t)\ ] + [0][V_1]$$

SIMULINK MODEL:



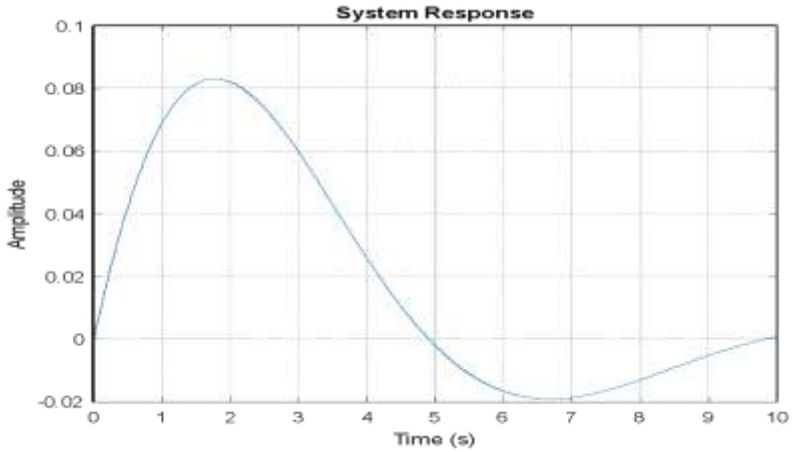

```
% Given State Model
L=10;
Cap=0.2;
R=6;
A=[0 1/Cap; -1/L -R/L];
B=[0; 1/L];
C=[0 1];
D=[0];
sys = ss(A, B, C, D);
```

```
% Define Input Signal
t = linspace(0, 10, 1000);
u=ones(1,length(t))

% Simulate System Response
[y, t, x] = lsim(sys, u, t);


% Plot System Response
figure;
plot(t, y);
grid on;
title('System Response');
xlabel('Time (s)');
ylabel('Amplitude');
```

RESULT:



Time Response from State Model of a system

The Time response using State Model of a system, excited by a Step Input has been observed and the Maximum Peak Amplitude is found to be 0.0832 within 2 seconds of the excitation.