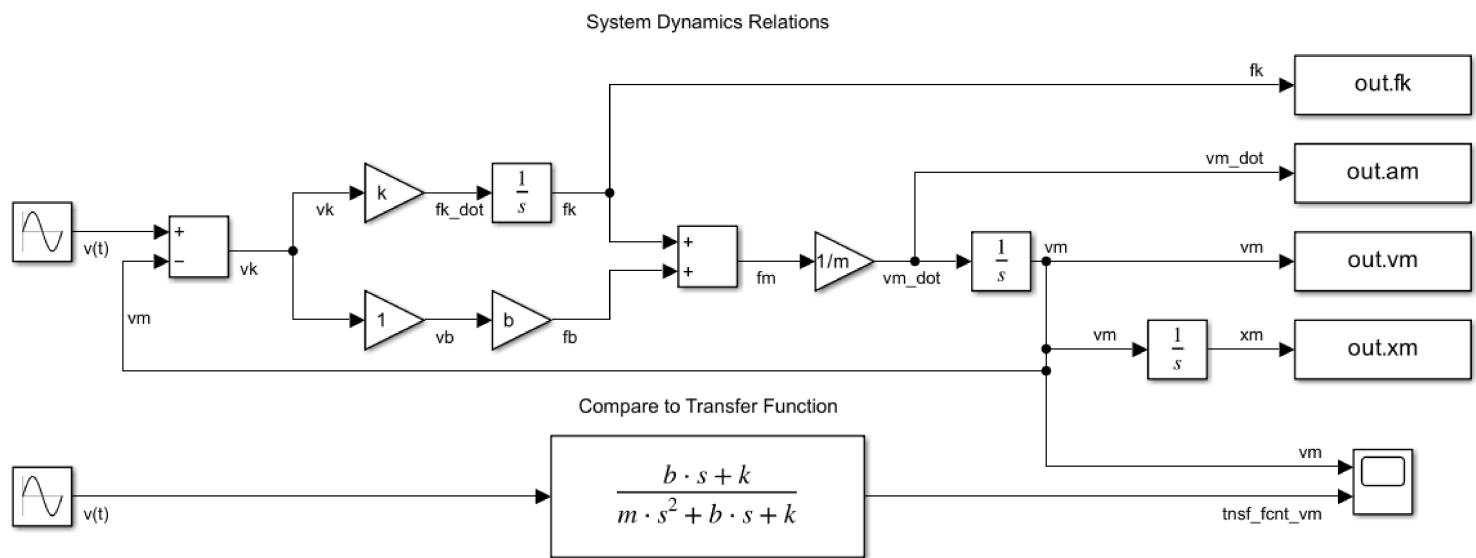```matlab
clear;

% Mass-spring-damper system parameters
k = 10; % [lbf/in]
m = 1; % [lbf*s^2/in]
b = 2; % [lbf*s/in]

% Define the simulation settings
opt = simset('RelTol', 1e-6);

% Run the simulation for 5 seconds using selected settings simultaneously
% importing the outputs of the simulink file to the MATLAB file
simout = sim("ME322_Exercise_2_Prelab_Simulink", 15, opt);

snapshotModel("ME322_Exercise_2_Prelab_Simulink");
```



System Dynamics Relations

Compare to Transfer Function

$$\frac{b \cdot s + k}{m \cdot s^2 + b \cdot s + k}$$

```matlab
% Adjusting the size of the plot to be visible
figure('Position', [0 0 1000 1300]);
tiledlayout("vertical");
% Create the first subplot
nexttile;
    plot(simout.tout, simout.xm, LineWidth=1);
    % Label the axes and add a subplot title
    xlabel("Time, t [s]");
    ylabel("Position, x_m(t) [in]");
    title("Position vs Time");
% Create the second subplot
nexttile;
    plot(simout.tout, simout.vm, LineWidth=1);
    % Label the axes and add a subplot title
    xlabel("Time, t [s]");
    ylabel("Velocity, v_m [in/s]");
    title("Velocity vs Time");
```

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```matlab
nexttile;
    plot(simout.tout, simout.am, LineWidth=1);
    % Label the axes and add a subplot title
    xlabel("Time, t [s]");
    ylabel("Acceleration, a_m [in/s^2]");
    title("Acceleration vs Time");
nexttile;
    plot(simout.tout, simout.fk, LineWidth=1);
    % Label the axes and add a subplot title
    xlabel("Time, t [s]");
    ylabel("Spring Force, f_k [lbf]");
    title("Spring Force vs Time");
```