Laboratory One

0.1. The objective is to learn basic Simulink functions. Build Simulink simulation programs for the following systems.

1. $G(s) = \frac{3}{(s+1)}$, input signal is a step signal with amplitude of 1, and sampling interval $\Delta t = 0.01$ and simulation time is 10.
2. $G(s) = \frac{3}{s^2+0.3s+1}$, input signal is a step signal with amplitude of 0.5, and sampling interval $\Delta t = 0.001$, and simulation time is 50.

0.2. The objective is to learn the communications between Simulink and MATLAB. Build MATLAB/Simulink simulation programs for the following systems where the transfer functions are defined in MATLAB program and the computed data to be displayed in MATLAB plots.

1. $G(s) = \frac{3(-s+3)(s+0.2}{(s+1)(s+2)(s+10)}$, input signal is a sinusoidal signal with amplitude of 1, and sampling interval $\Delta t = 0.001$ and simulation time is 80.
2. $G(s) = \frac{3}{(s^2+0.3s+1)(s+3)^2}$, input signal is a square wave signal with period of 20, and amplitude of 0.5, and sampling interval $\Delta t = 0.001$, and simulation time is 100.

0.3. The objective is to learn closed-loop control system simulation. Simulate the following control systems with proportional control $K_c = 10$, and $G(s) = \frac{0.2}{s^2+2s+3}$. In MATLAB, plot your reference signal, control signal and output signal.

1. Reference input signal is a step with amplitude of 3, sampling interval $\Delta t = 0.01$, and simulation time is 100.
2. Add input disturbance signal with amplitude of -3 at time $t = 50$.
3. Add measurement noise with standard deviation of 0.1 at time $t = 50$.

0.4. Repeat the simulations given in Problem 0.3 with the following control systems with proportional control $K_c = 1$, and $G(s) = \frac{1}{(s^2+2s+1)(s+6)}$. In MATLAB, plot your reference signal, control signal and output signal.

1. Reference input signal is a step with amplitude of 10. Choose your own sampling interval Δt and simulation time .
2. Add input disturbance signal with amplitude of -3 at half of your simulation time.
3. Add measurement noise with power of 0.001 at time $t = 0$.