

Simulink Exercise

Experiment No 7 EE371 Instrumentation &Control and Laboratory IIT Patna
 Prepared by Shovan Bhaumik Duration: 3 hours

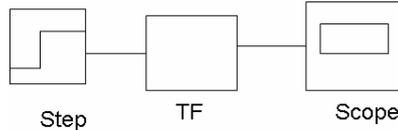
1.1 Objective:

- (i) Familiarisation with Matlab software from control system engineer point of view.

1.2 Exercise Problems:

Background

- (a) From Matlab command prompt open the Simulink block and a new file. Drag the blocks from respective libraries to the new windows and connect them as shown below.



Set the step time to 1, initial value zero and final value 1. In auto scale graph set the initial time range to 10, Initial y-min to -5, Initial y-max to 5. Double click on the Transfer Function block and set Numerator to [1] and Denominator to [1 1].

Set the Simulation Parameters as follows : Start Time = 0, Stop Time = 10, Min Step =0.001, Max Step = 0.01, Tolerance = 1e-3, and the method of simulation is Runge–Kutta 5. Start simulation and observed the results.

- (b) Change the input block to a Sine Wave generator with unity amplitude, and frequency to 10 rad/s, and phase to 0 rad. Use a Scope block and observe the results of the simulation. To set the axis range you may double click on scope block.
- Construct the following model using simulink. Adjust K_1 and K_2 so that $\omega_n = 12$ rad/s and $\xi = 0.01/0.2/1/3$.

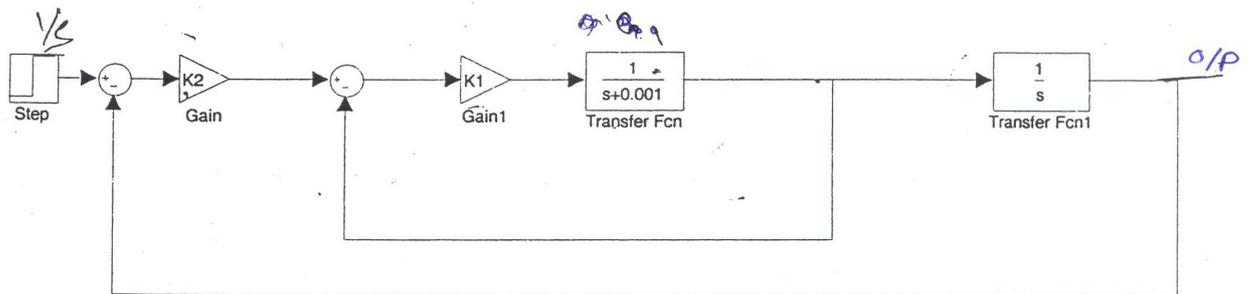


Fig 1

3. Create the following model using Simulink where $A=[-2 \ -1; 1 \ 0]$; $B=[1;0]$; $C=[0;1]$, $D=0$.

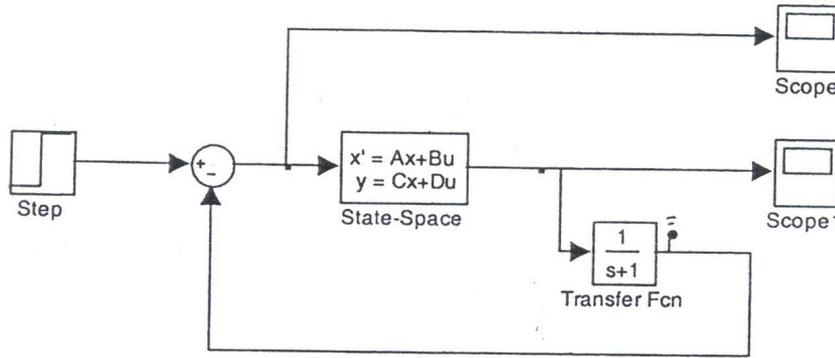


Fig 2

- (a) Observe the response of the two Auto Scale Graphs after appropriately adjusting their parameters.
 - (b) Disconnect the Auto Scale Graphs and introduce a Mux block from the connections library. Click on the block and set the number of inputs to 2.
4. Construct the following model.

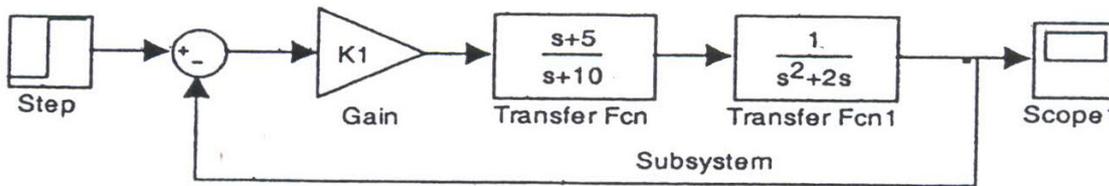


Fig 3

Select the part enclosed by the dotted line to form a subsystem. Name the subsystem to “Open loop system”. Obtain the step response of the closed loop plant. Change the gain in forward path and observe the response of the system.

5. Construct the following model in Simulink. Start with the value of K set to 1 and increase it. Note the step response of the system for each case. Introduce a Transport Delay block in the forward path and note the step responses for different values of K as in the previous case

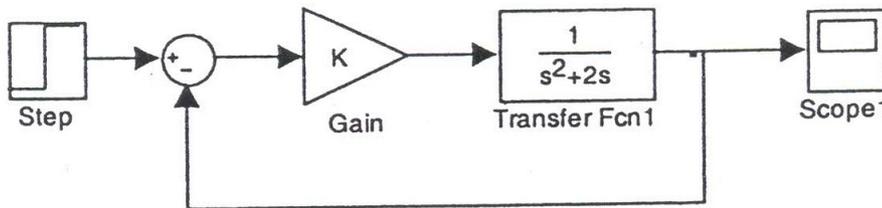


Fig 4

Acknowledgement:

The instructor sincerely acknowledges the help received from control group, Jadavpur University to formulate this instruction sheet.