

Tutorial 1

World of MATLAB

The objective of this tutorial is to get you familiar with some fundamental commands you can use for modeling, designing and tuning control systems.

Perform all the programming steps in a single file named **<roll_number>_T1.m** and submit that along with a PDF of the answers by **midnight**.

The denominator of a system's transfer function \mathbf{G}_1 is:

$$P_1 = s^5 + 2s^4 + 7s^3 + 10s^2 + 7s + 1$$

Exercise 1:

- Generate the Routh table for \mathbf{G}_1 and identify the stability of the system using the Routh-Hurwitz criterion.
- If a proportional controller (*gain K*) is used in this case with a closed loop unit feedback, for what values of K is the system stable? Justify your answer with both Routh table as well as a snapshot of a rootlocus plot. (*rlocus*)
(Assume numerator of $\mathbf{G}_1 = 1$)

Exercise 2:

1. Plot the poles of \mathbf{G}_1 using the ***plot*** command
2. Identify if the system is stable or unstable, automatically, using a script
3. Plot the step response of this system using the command ***step***. Does the response correspond with the nature of the system identified in the previous step?
4. The *rlocus* command in MATLAB plots poles with "x" and zeros with "o". Add a zero to this system (at a location of your choice) and report its effect on the root locus plot.