EBU6503 Control Theory

Lab 1: Matlab Familiarisation

1. Run Matlab and open Help, Matlab Help
2. Select Control System Toolbox
3. Getting Started
4. Building Models
    - Linear models
    - Linear Model Representations
    - SISO Example, DC Motor, Example Transfer Function
    - Continuous SISO Models
        - Create as sys_tf=tf(1.5,[1 14 40.02])
5. Analysing Models
    - LTI Viewer

    Examples: Time and Frequency
        - In the Command window, “load ltiexamples”
        - Ltiview
        - File Import
            - Step Response
        - Displaying Response Characteristics
        - Changing Plot Type
6. Designing Compensators
    - SISO Design Tool
        - Opening the SISO Design Tool
        - Importing Models into SISO Design Tool

    How to Create Own Model*: (refer to Help, Running Matlab Functions, Running Functions and Entering Variables)*
7. Help
    - Control System Toolbox
        - Creating and Manipulating Models
            - lti Models
            - Creating lti Models
            - TF Models

    In Command Window: Type TF Model, e.g. sys_lab1=tf(10,[1 2 6])
    Saves in Workspace

REPORT:

1. For each of the investigations in the above introduction, obtain a variety of plots and note the system characteristics (such as step response, frequency response, root locus, etc).

2. Use Root Locus Technique to investigate the system whose open-loop transfer function is

$$G(s)H(s) = \frac{K(s+2)}{s(s+1)(s+3)(s+4)}$$

   Attempt to design a Controller such that the Closed-Loop system behaviour has a minimum damped frequency of oscillation of 2.5 rad/sec AND a maximum peak overshoot of 20%. Comment on your results.