**M-Tutorial 1**

1. The open loop (OL) transfer function (TF) of a system is G(s) = 30/(s-10). Plot the step response of G(s).
2. For the above OL TF, plot the step response of the closed loop (CL) system with H(s)=(s+1)/(s+2) as gain in the feedback path.
3. Also plot the step response when H(s) is put in the forward path, i.e., in series with G(s) and an unity negative feedback is used.
4. Comment on the three responses.
5. Plot the step responses of the CL system with the OL gain G(s) = K\*(s+2)/(s^2+2\*s+4) and with the gain in the feedback path H(s) =(s+3)/(s+5) (with K taking the values 0.25, 0.4, 0.6, 0.8) on one figure. Use the following colours for each of the four plots: red, blue, green, yellow respectively. Title the figure as follows without the quotes: ``Step response of closed loop system for different values of K''
6. The roots of a polynomial are -3, -4, -6. Find the coefficients of the polynomial assuming that the coefficient of the highest order term is 1. Take this polynomial as the denominator of an OL TF that has for the numerator the polynomial K\*(s+2). Here K takes the values 1, 1.2, 3. Plot the step response of the unity feedback CL system formed around this OL TF. Set up the time axis from 0 to 20 seconds. Name the x-axis ``Time (up to 20 s)'' and y-axis ``CL system output'', without the quotes. Generate all plots on one figure.
7. Given G(s) = 5/(s^3+5\*s^2+9\*s+4)
8. Plot the Bode magnitude and phase plots
9. using the function `bode'.
10. without using `bode'.
11. Plot the Bode magnitude and phase plot with frequency (w) from 10^(-3) to 10^5 rad/s.
12. Draw the Bode magnitude plot of G(s) = 1/(s+1) for the following two cases
13. plot 20log(G(jw)) versus w (on a linear w scale).
14. plot 20log(G(jw)) versus w (on a logarithmic w scale).

Do not use the function 'bode'. Use the expression of G(s) to write G(jw) as a function of w.