Control and Instrumentation Laboratory (EC692) Assignment No.: 2

Dhiman Sarkar

Roll: 19101105086
Dept. of Electronics and Comm. Engineering
Jalpaiguri Government Engineering College
Email: ds2286@ece.jgec.ac.in

Alok Barman

Roll: 19101105087
Dept. of Electronics and Comm. Engineering
Jalpaiguri Government Engineering College
Email: ab2287@ece.jgec.ac.in

Alka Tigga

Roll: 19101105088
Dept. of Electronics and Comm. Engineering
Jalpaiguri Government Engineering College
Email: at2288@ece.jgec.ac.in

Azizul Mallick

Roll: 19101105089
Dept. of Electronics and Comm. Engineering
Jalpaiguri Government Engineering College
Email: am2289@ece.jgec.ac.in

Abstract—**Perform various tasks assigned by the instructor.**

I. BRIEF DESCRIPTION OF THE ASSIGNMENTS

1) Consider the closed-loop system defined by $\frac{2\zeta s+1}{s^2+2\zeta s+1}$ where $\zeta =$0.2, 0.4, 0.6, 0.8, and 1.0. Using MATLAB, plot a two-dimensional diagram of unit-impulse response curves without using impulse command.

2) Plot the root locus of the following system $G(s)H(s) = \frac{K}{s(s+1)(s+2)}$

II. MATLAB SCRIPTS

Exercise - 1   Since the Laplace Transform of Unit Impulse is 1, the output of the system is same as the system function. So to get the response (i.e. in time domain), we performed a Inverse Laplace Transform and plotted the response.

```
1    syms s t;
2
3    z=.4; %Values of zeta or z is manually changed form the array [0.2, 0.4, 0.6, 0.8, and
         ↪ 1.0]
4
5    h_s_sym = @(s, z) (2.*z.*s + 1) ./ (s.^2 + 2.*z.*s + 1);
6
7    h_t_sym = ilaplace(h_s_sym(s,z));
8    h_t = @(t2) subs(h_t_sym,t,t2);
9
10   t=0:.1:40;
11   A=h_t(t);
12
13   plot(t,A);
14
15   box on; grid on;
16   xlabel("Time");
```

```
17   ylabel("Amplitue");
18   ttl = strcat('Unit Impulse Response of the system, $$H(s)=\frac{2\zeta s+1}{s^2+2\
          ↪ zeta s + 1}$$; for $$\zeta=',num2str(z),'$$');
19   title(ttl,'interpreter','latex');
```

Exercise - 2

```
1    syms s k;
2
3    H = tf([1] , conv(conv([1 0],[1 1]),[1 2]))
4
5    rlocus(H);
```
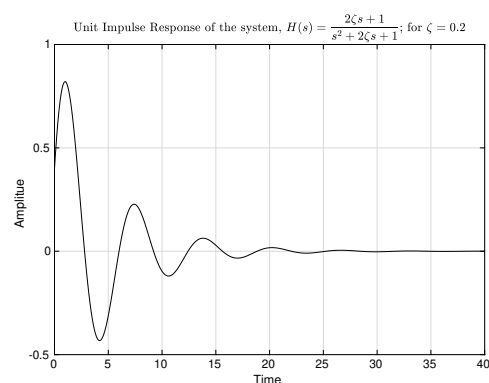
III. OUTPUT RESULTS AND PLOTS

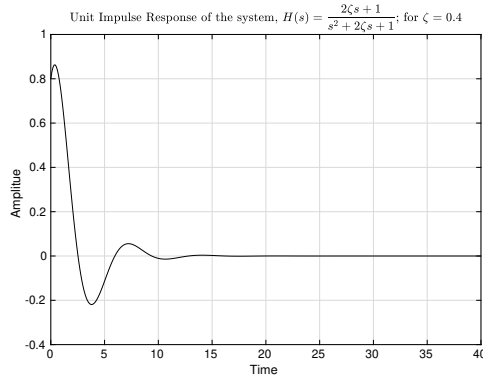Figure 1. Impulse Response of the system described in Problem.1 for $\zeta = 0.2$

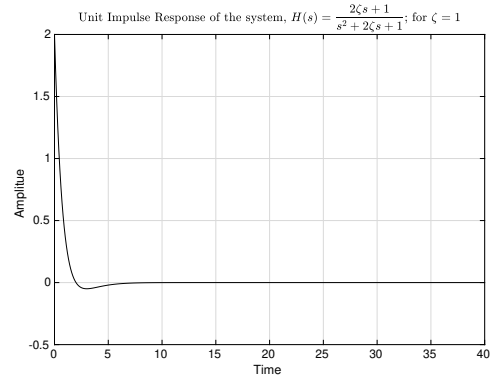Figure 2. Impulse Response of the system described in Problem.1 for $\zeta = 0.4$

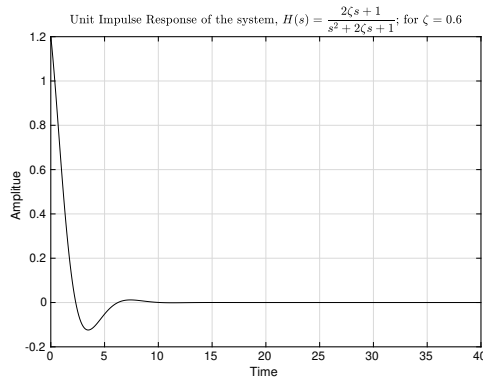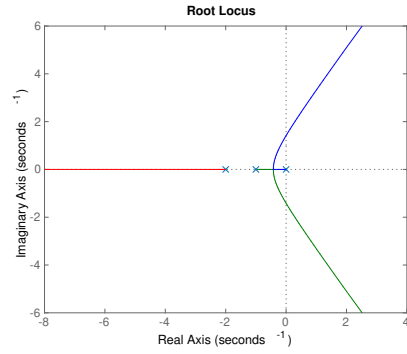Figure 3. Impulse Response of the system described in Problem.1 for $\zeta = 0.6$

Figure 4. Impulse Response of the system described in Problem.1 for $\zeta = 0.8$

IV. OBSERVATIONS & CONCLUSION

1) From the first experiment we can observe that the system is oscillatory for lower values of ζ. But for higher values of ζ (≥ 1) the system response in very snappy.
2) From the Root Locus plot of the second system described in Problem.2 we can clearly see that the system has three poles and it has both real and conjugate complex poles.

Figure 5. Impulse Response of the system described in Problem.1 for $\zeta = 1.0$

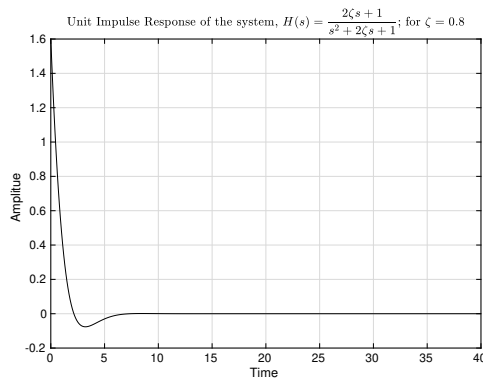Figure 6. Root Locus of the system for described in Problem.2

V. ACKNOWLEDGMENT