```
 1 clc;
 2
 3 p = 4*(tf([1 8],1)*tf([1 2],1))/ (tf([1 4],1)*tf([1 2↙
3.25],1));
 4
 5 % zeta = 0.52;
 6 % omega_n = 30;
 7 % c = design_PI(p,[complex(-zeta*omega_n,omega_n * sqrt(1-↙
zeta^2)),complex(-zeta*omega_n,-omega_n * sqrt(1-zeta^2))])
 8
 9 num_of_iterations = 100;
10 mp_max = 0.16;
11 mp_min = 0.14;
12 ts_max = 0.35;
13 ts_min = 0.25;
14 M_p = linspace(mp_min*1e-8, mp_max*1e1, num_of_iterations);
15 ts_1p = linspace(ts_min*1e-8, ts_max*1e1,↙
num_of_iterations);
16
17 c_s = {};
18 to_break = 0;
19 p = 4*(tf([1 8],1)*tf([1 2],1))/ (tf([1 4],1)*tf([1 2↙
3.25],1));
20 for i = 1:num_of_iterations
21     for j = 1:num_of_iterations
22         zeta = (abs(log(M_p(i)))) / sqrt(pi^2 + (abs(log↙
(M_p(i)))^2));
23         omega_n = (log(1/0.01)) / (zeta * ts_1p(j));
24         c = design_PI((p), [complex(-zeta*omega_n,omega_n *↙
sqrt(1-zeta^2)), complex(-zeta*omega_n,-omega_n * sqrt(1-↙
zeta^2))]);
25         c_s{end + 1} = c;
26         sys = c*p / (1+c*p);
27         info = stepinfo(sys,"SettlingTimeThreshold", 0.01);
28         if (info.Overshoot > mp_min*100) && (info.Overshoot↙
```

```
< mp_max*100)
29              if (info.SettlingTime > ts_min) && (info.↙
SettlingTime < ts_max)
30                  zeta
31                  omega_n
32                  c
33                  info
34                  disp("succes");
35                  to_break = 1;
36                  break
37              end
38          end
39          disp(sprintf("j = %d, i = %d",j,i));
40      end
41      if to_break
42              break
43          end
44      disp(sprintf("i = %d",i));
45  end
46
47  %%
48
49  time = 0:0.01:1;
50  [y,t] = step(sys,time);
51  info = stepinfo(sys)
52
53  fig1 = figure ("Name","Step Response of the Closed-Loop↙
System with the PI Controller",'Position',[100 300 900 500]);
54  hold all
55  grid on
56  grid minor
57
58  plot(t, y, 'LineWidth',2,'Color',"#0072BD")
59
60  title ("Step Response of the Closed-Loop System with the PI↙
```

```
Controller");
61 subtitle("Almog Dobrescu 214254252");
62 % legend({''},'FontSize',11 ,'Location','southeast')
63 %exportgraphics(fig1, '2.3grap1.png','Resolution',1200);
64
65 %%
66 time = 0:0.01:20;
67 ramp = 1*time;
68 y_ramp = lsim(sys,ramp,time);
69
70 for i = 1:length(time)
71     error_y(i) = y_ramp(i) - ramp(i);
72     i;
73 end
74
75 fig2 = figure ("Name","Error to Unit Ramp Input of the↙
Closed-Loop System with the PI Controller",'Position',[100 300↙
900 500]);
76 hold all
77 grid on
78 grid minor
79
80 plot(time, error_y, 'LineWidth',2,'Color',"#0072BD")
81
82 title ("Error to Unit Ramp Input of the Closed-Loop System↙
with the PI Controller");
83 subtitle("Almog Dobrescu 214254252");
84 % legend({''},'FontSize',11 ,'Location','southeast')
85 %exportgraphics(fig2, '2.3grap2.png','Resolution',1200);
86
87
```