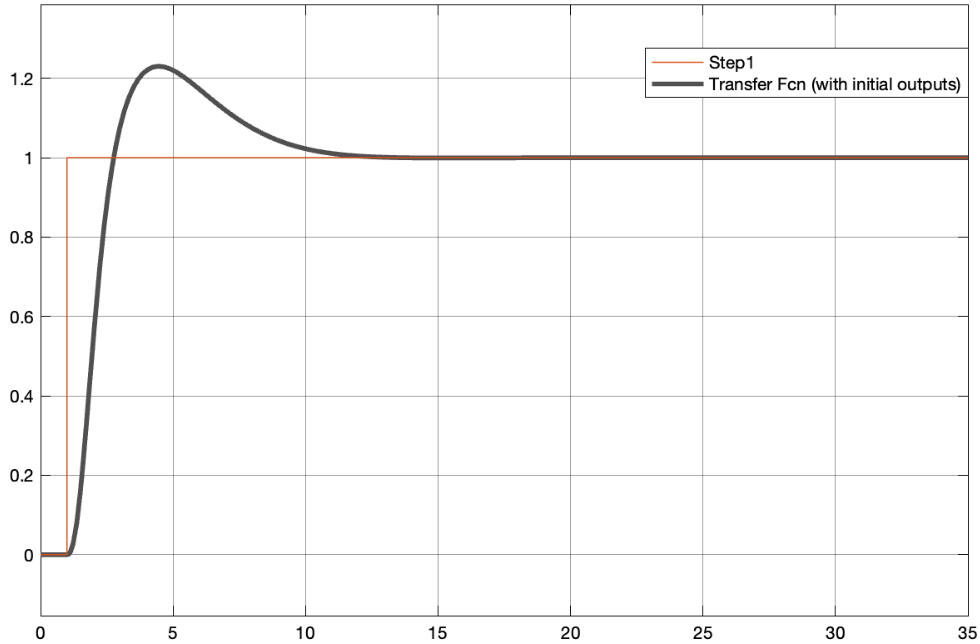
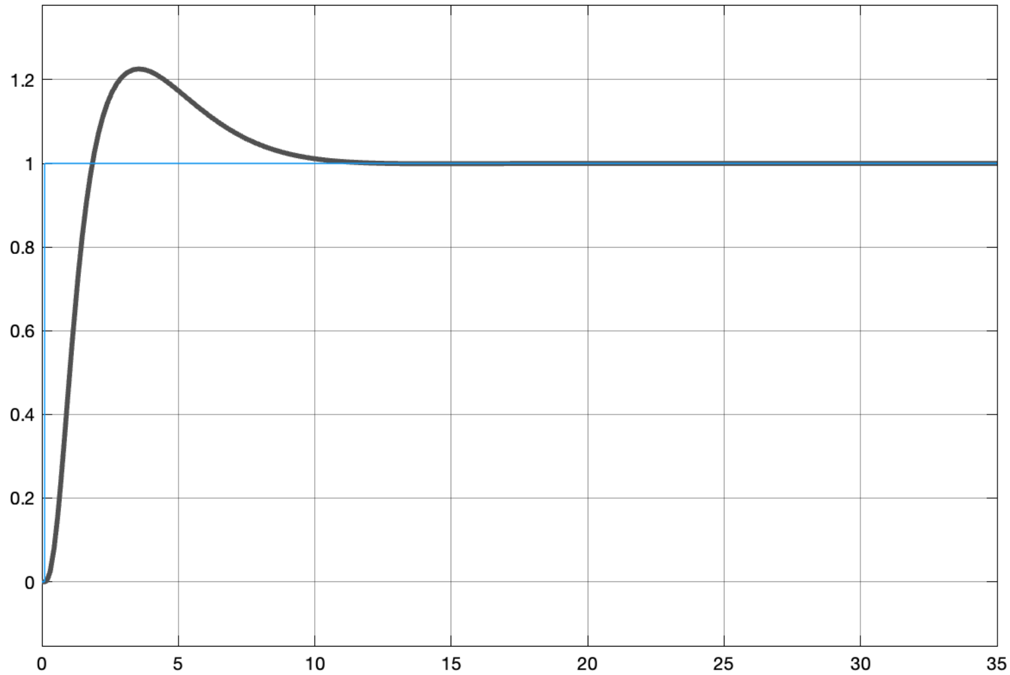
Plots for part 2: **To show that the effective transfer function of both the PID and the I-PD functions are same by showing their closed loop step response with overall unity feedback**



Plot 2.1 : Step response of PID controller with values(Kp = 13.2, Ki = 4, Kd = 10.9)



Plot 2.2 : Step response of I-PD controller with values(Kp = 13.2, Ki = 4, Kd = 10.9)

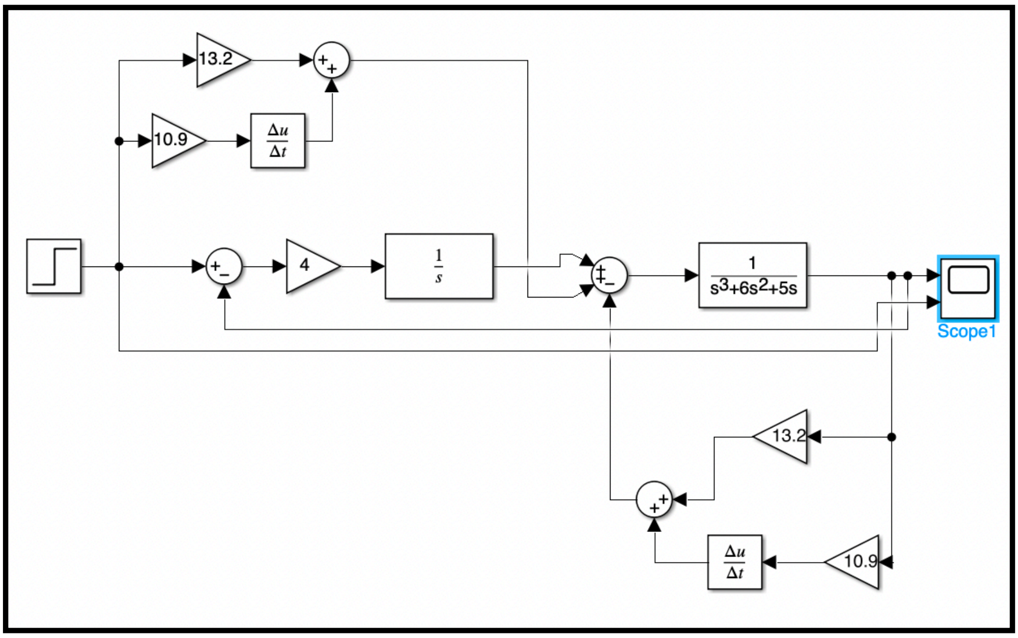


Fig 2.1: Simulink Design of part a of Qs 2 along with dashboard showing overall step response of the system

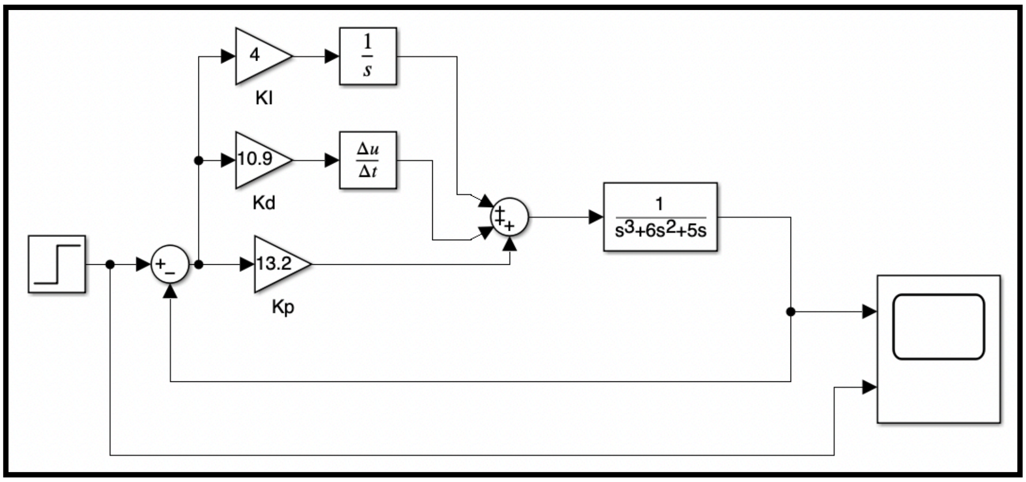


Fig 2.2: Simulink Design of part a of Qs 2 along with dashboard showing overall step response of the system

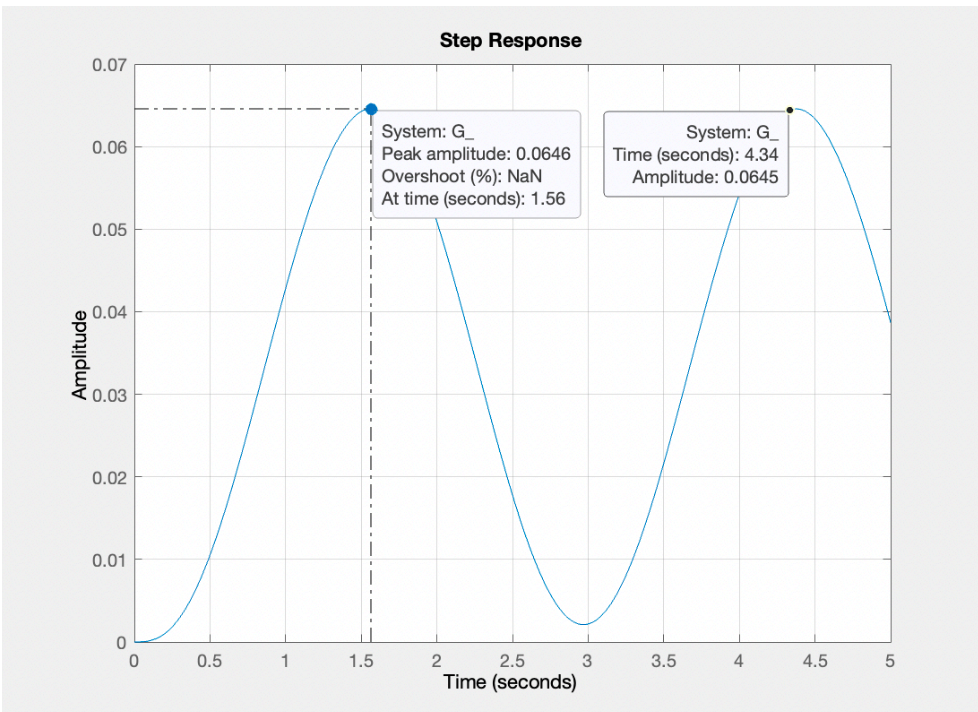


Fig 2.3 : Calculation of time period of sustained oscillation for Kcr = 30 is (4.34-1.56) = ***2.78 secs***

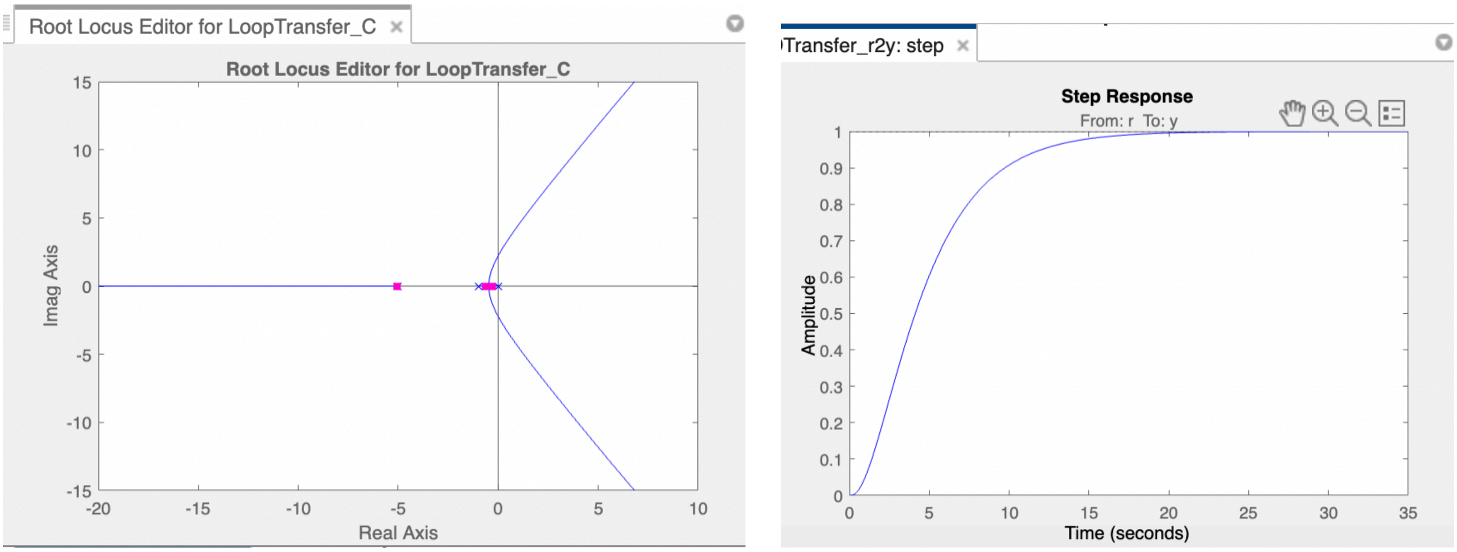


Fig 2.4: Root locus and closed loop step response of the uncompensated system

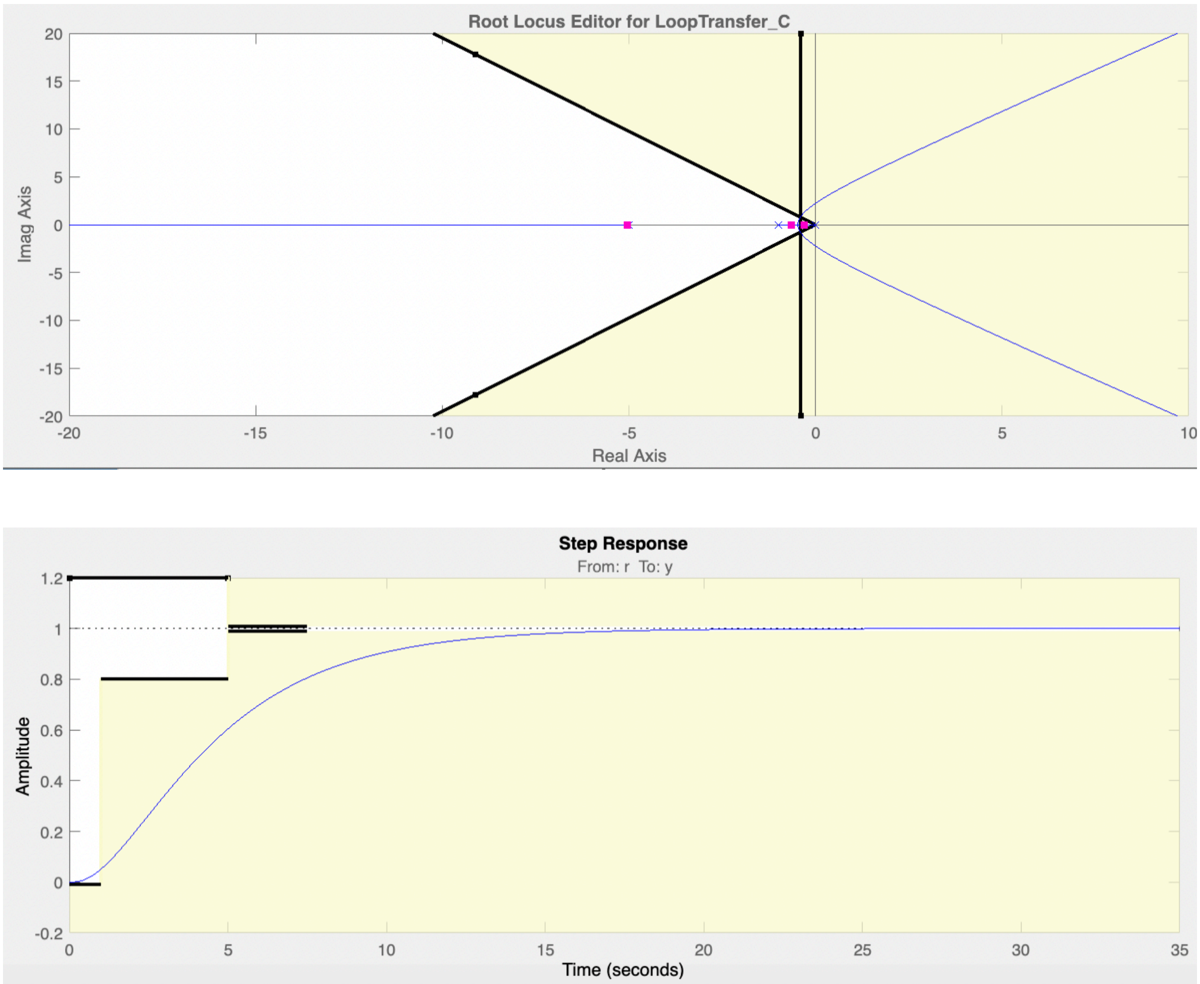


Fig 2.5: Root locus and closed loop step response of the uncompensated system with their transient bounds for pole placement in Matlab control studio *(RiseTime<1s, SettlingTime<10s, Peak Overshoot(%)<20%)*

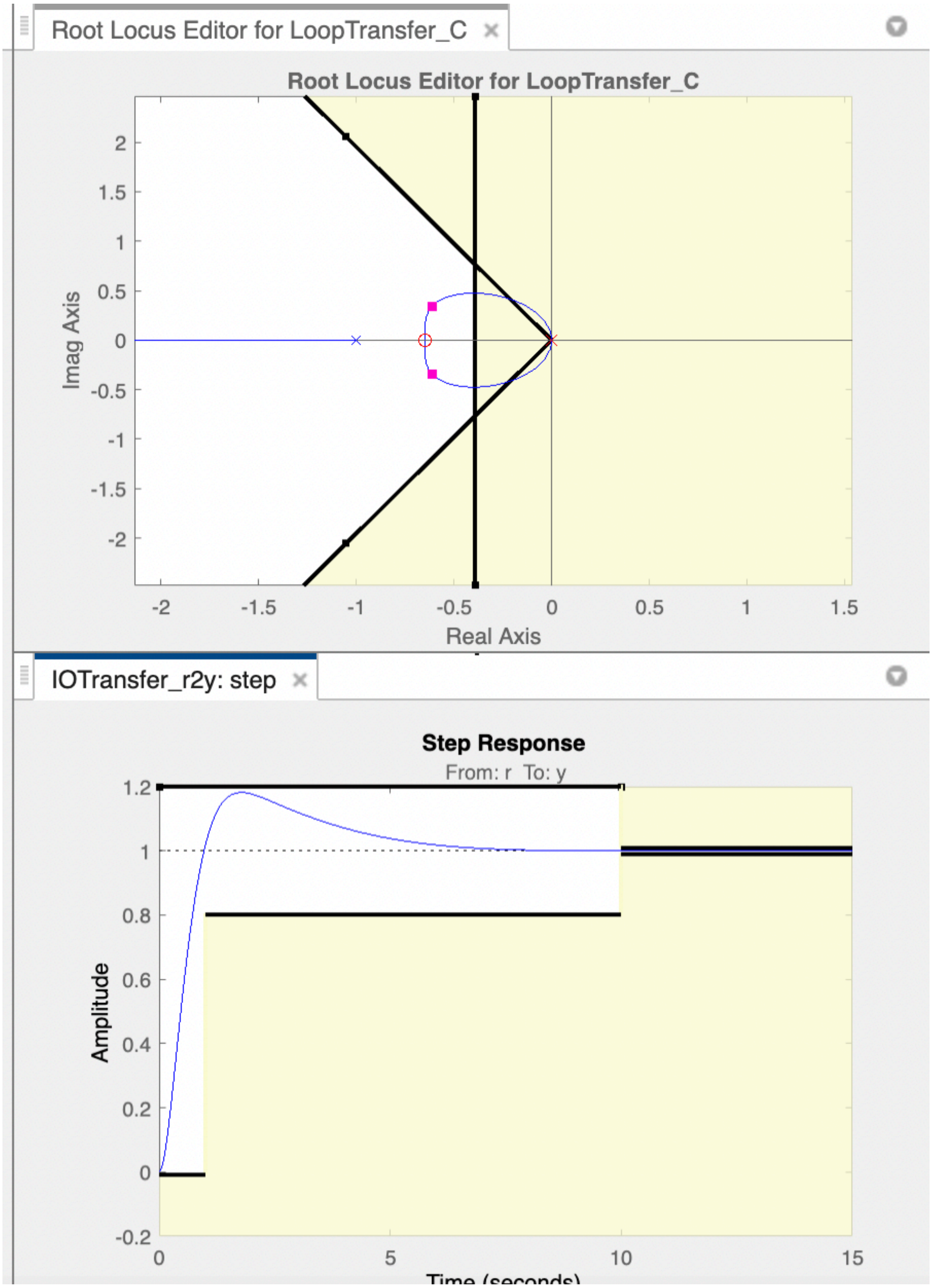


Fig 2.6: Root locus and closed loop step response of the compensated system with their transient bounds after completion of pole zero placement in optimal locations done on Matlab control studio *(Pole location: 0, Zero location: -0.65,-0.65)*

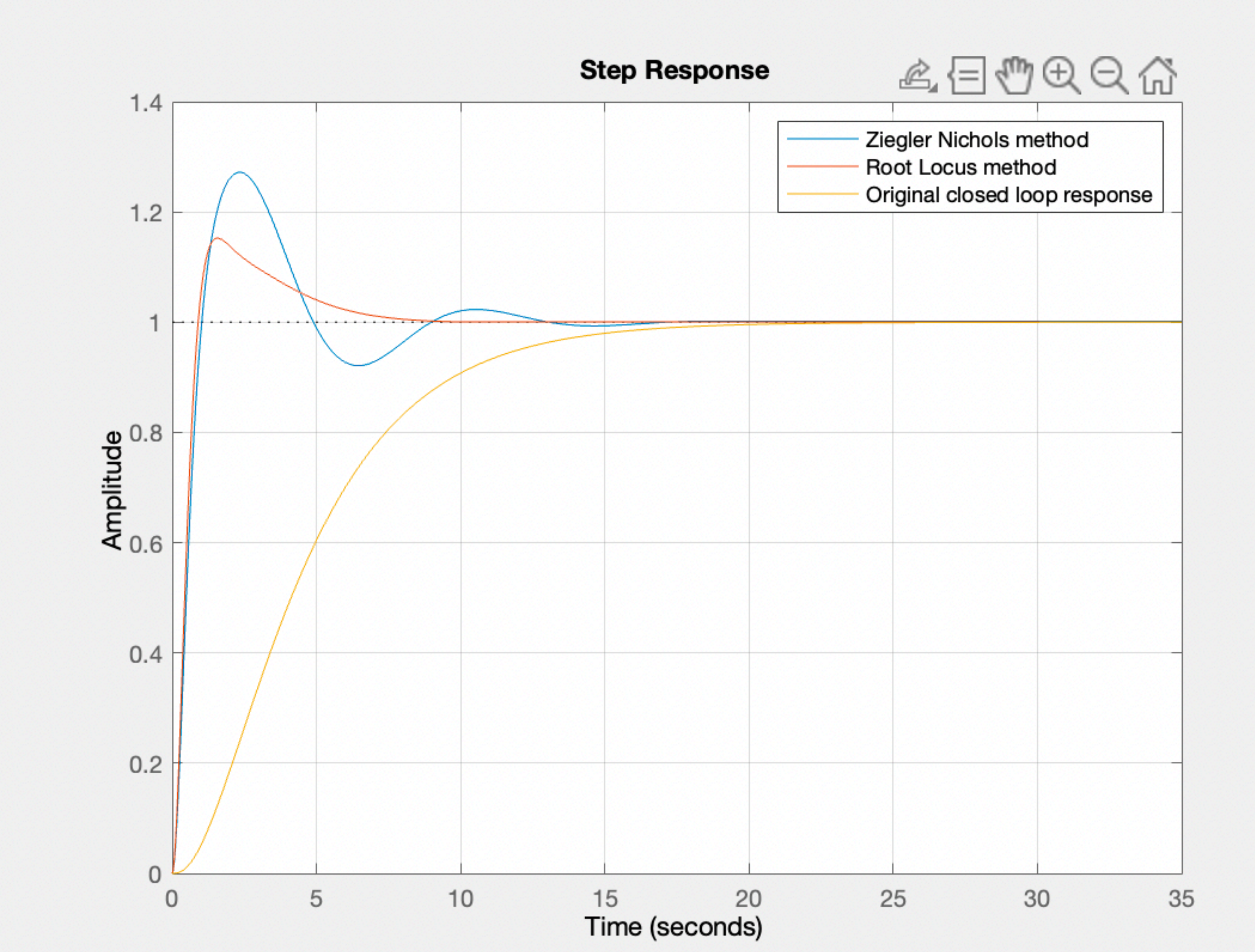
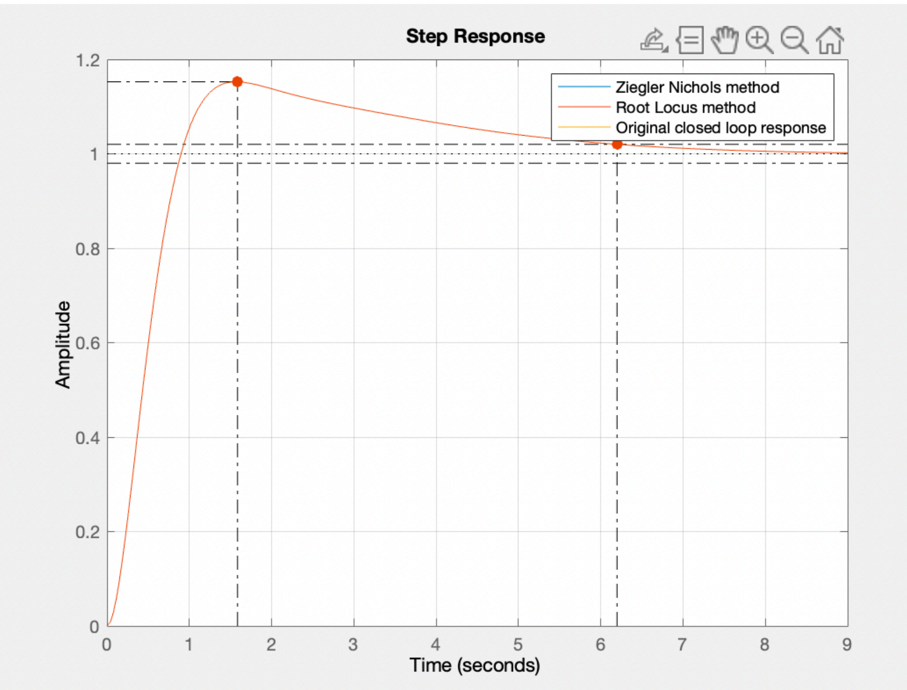


Fig 2.7: Comparison of the step response of the uncompensated system, PID controller designed using Zeigler Nichols tuning method and PID controller designed by root locus method(Zero pole placement in MATLAB control system designer).



Conclusion:

The PID controller designed by root locus method has the best transient as well as steady state characteristics.