Home Work #3

Ali BaniAsad 96108378

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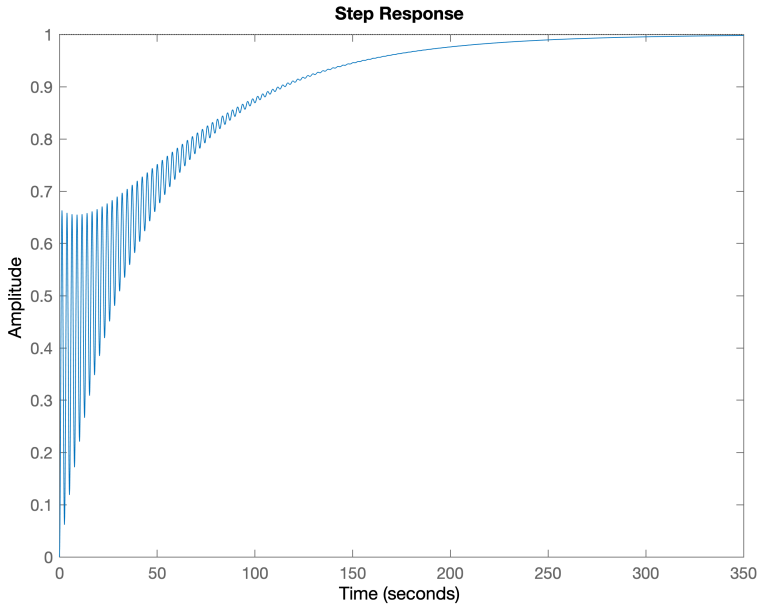
1 Question 1

From root locus we find out with add one real zero we change shape of root locus and with increasing gain system will be stable and without this zero when we increase gain system chgane better but in some where it goes unstable so with adding just one zero system will work fine and get problem require. For cancelling oscillation we use derivative controller.

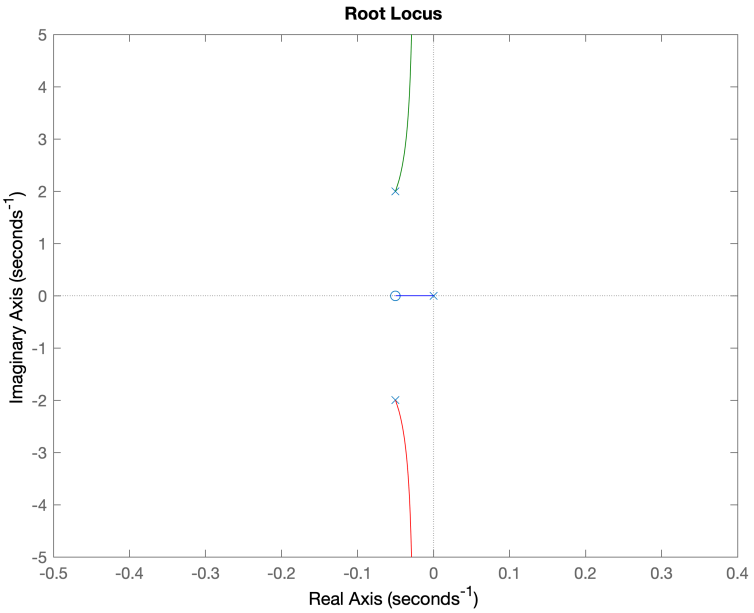
- system step responde

Figure 1: system step responde



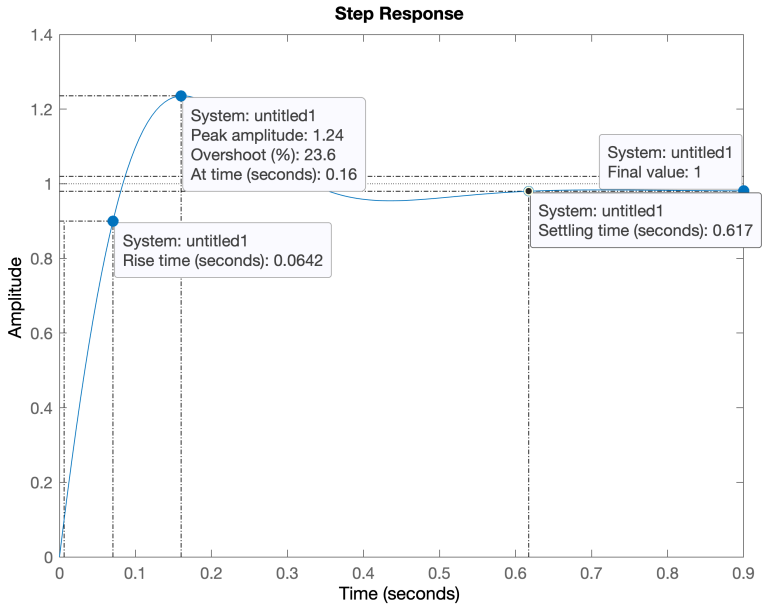
- system root locus

Figure 2: system root locus plot



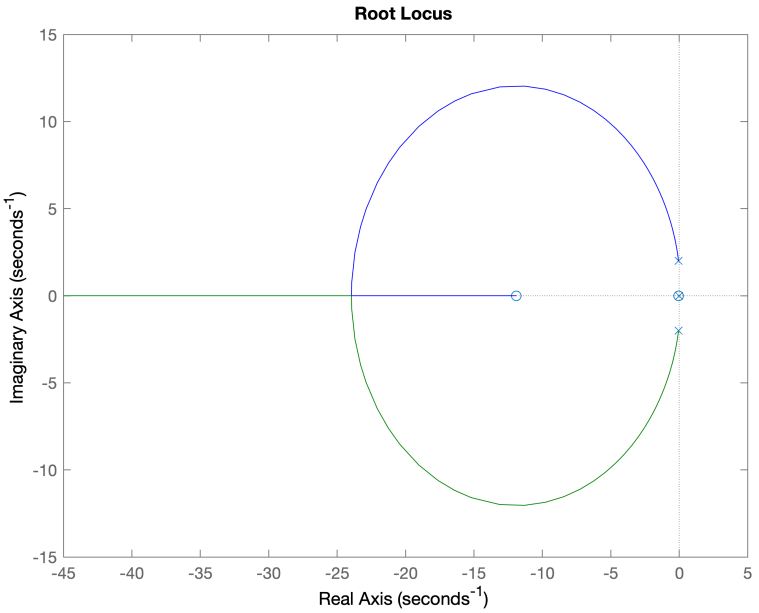
- system with controller step responde

Figure 3: system with controller step responde



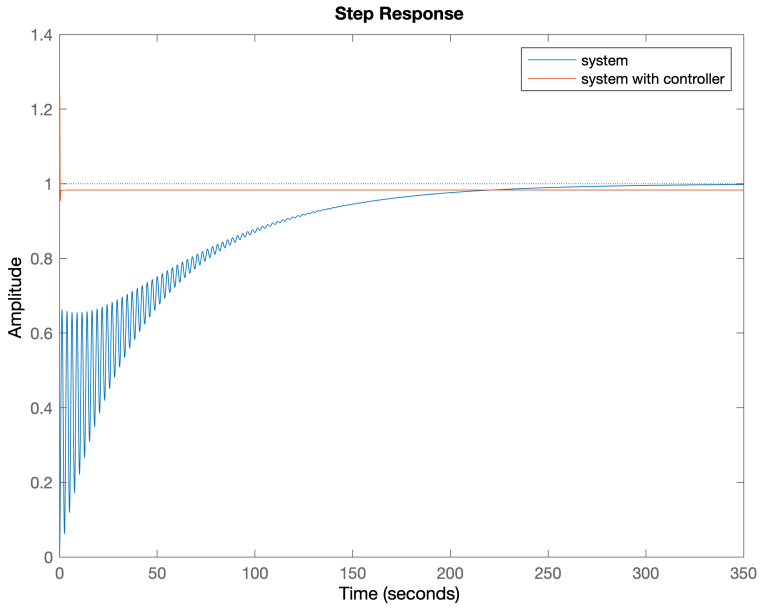
- system with controller root locus

Figure 4: system with controller root locus plot



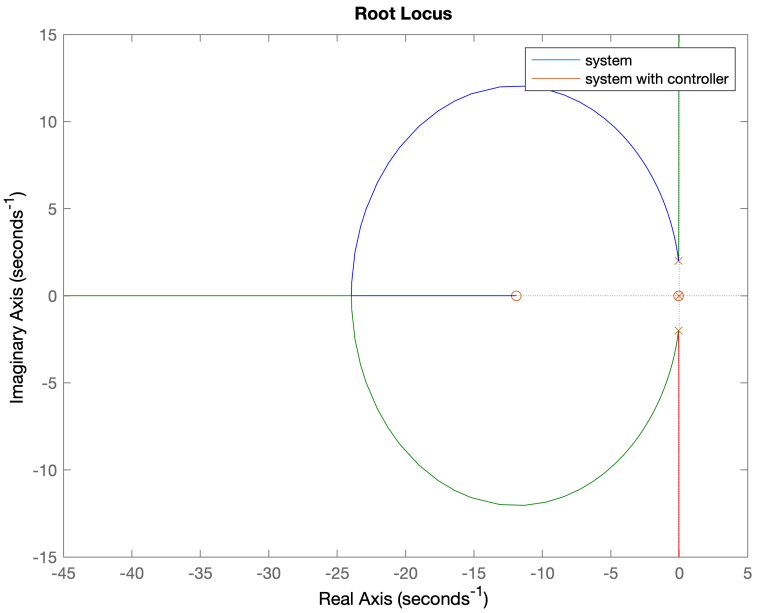
- system with and without controller step responde

Figure 5: system with and without controller step responde



- system with and without controller root locus

Figure 6: system with and withou controller root locus plot

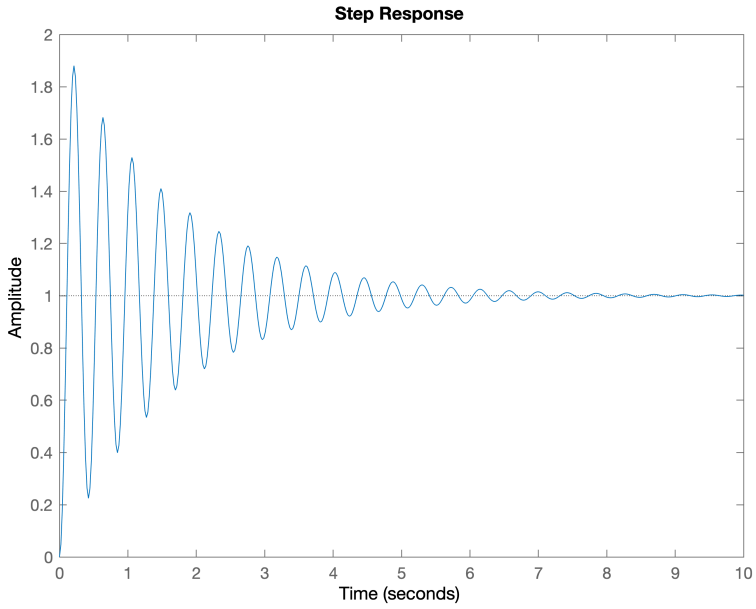


2 Question 2

In this problem we must lead and lag controller. We use lead controller to fix transient mode response and use lag controller to fix permanent state response.

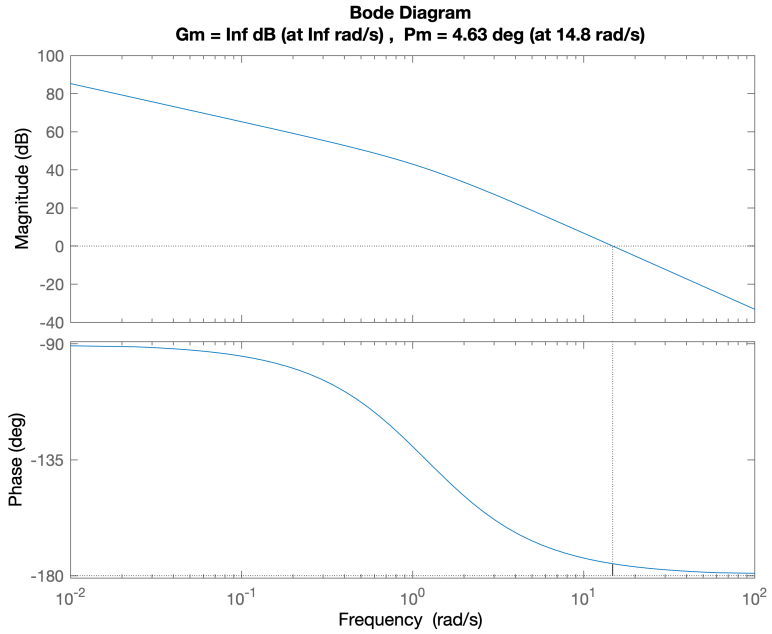
- system step responde

Figure 7: system step responde



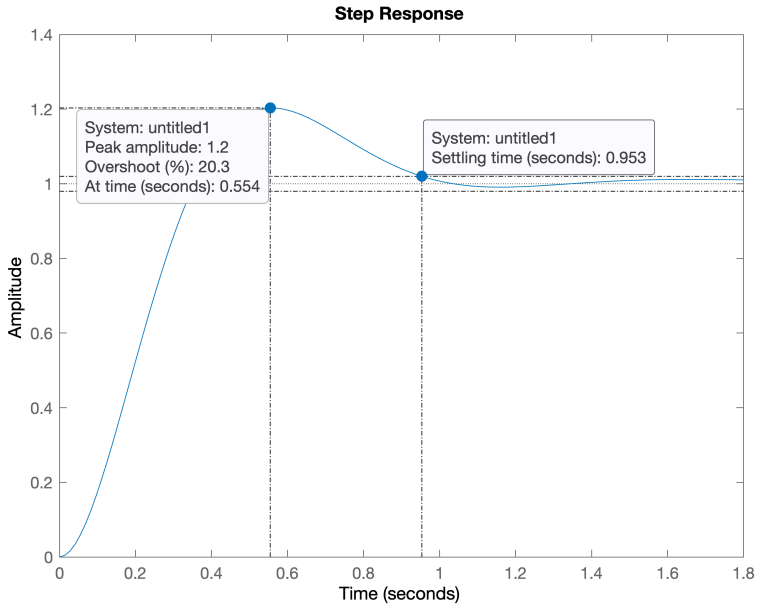
- system bode

Figure 8: system bode plot



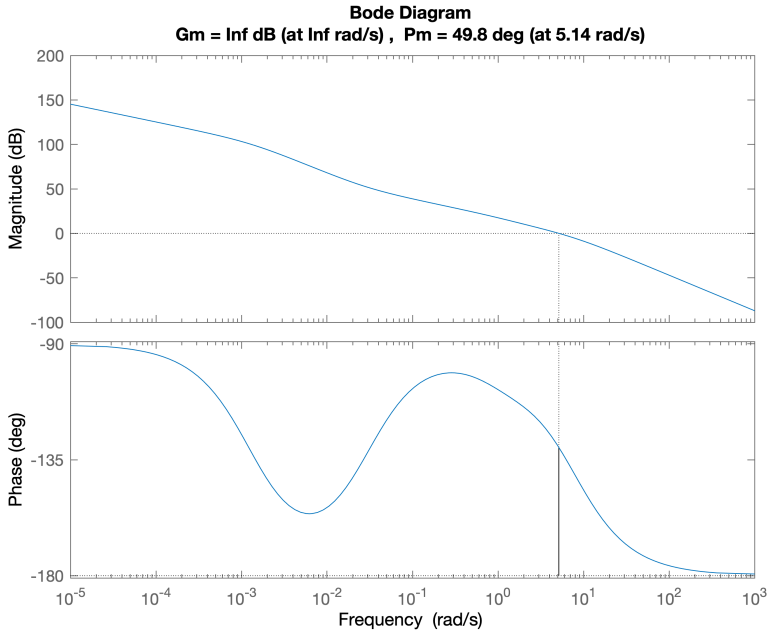
- system with controller step responde

Figure 9: system with controller step responde



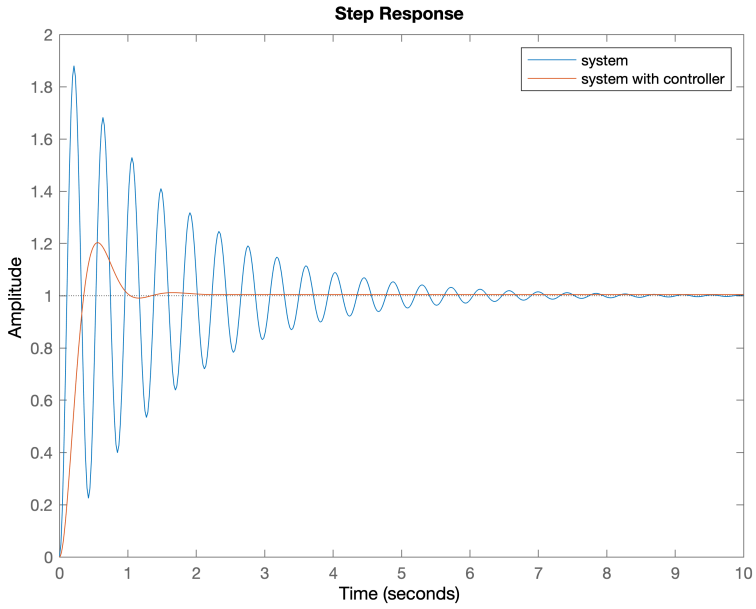
- system with controller bode

Figure 10: system with controller bode plot



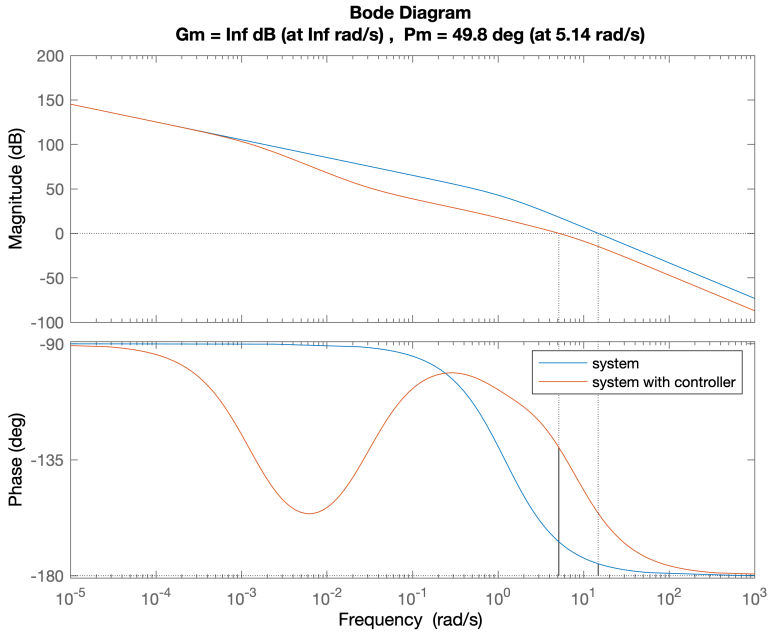
- system with and without controller step responde

Figure 11: system with and without controller step responde



- system with and without controller bode

Figure 12: system with and withou controller bode plot

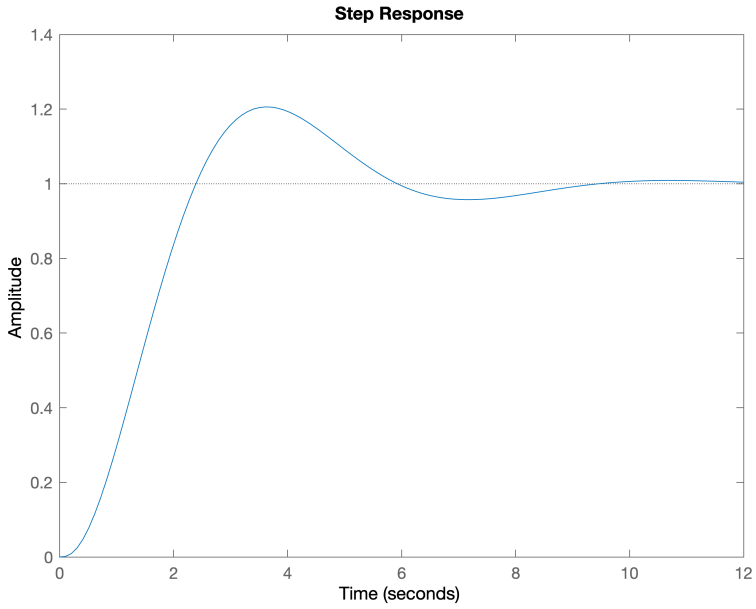


3 Question 3

We use lead controller to fix transient mode and solve problem.

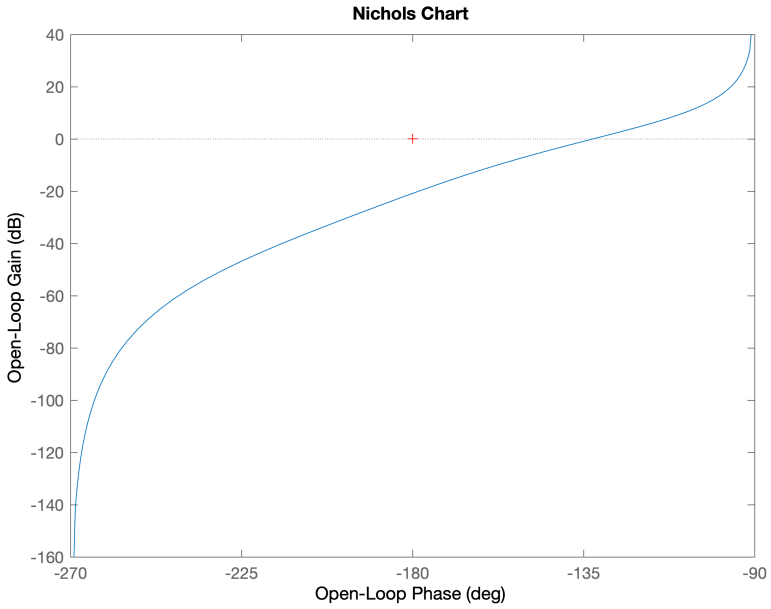
- system step responde

Figure 13: system step responde



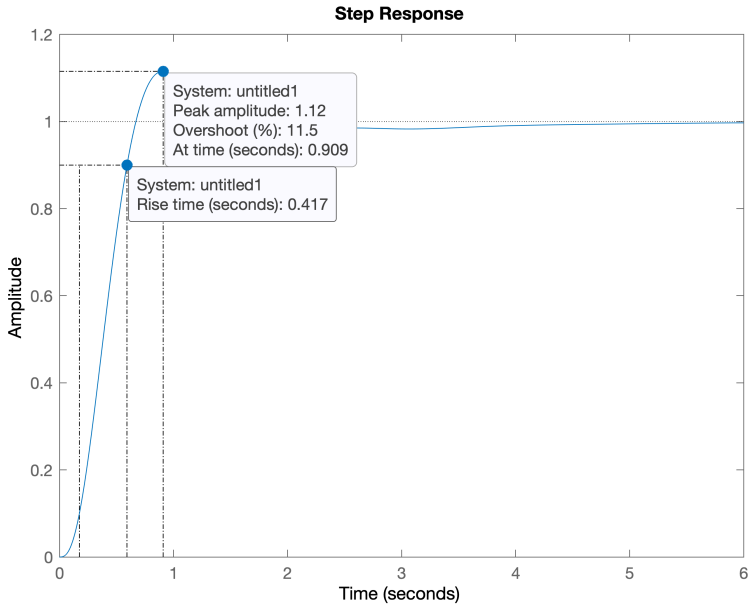
- system nichols

Figure 14: system nichols plot



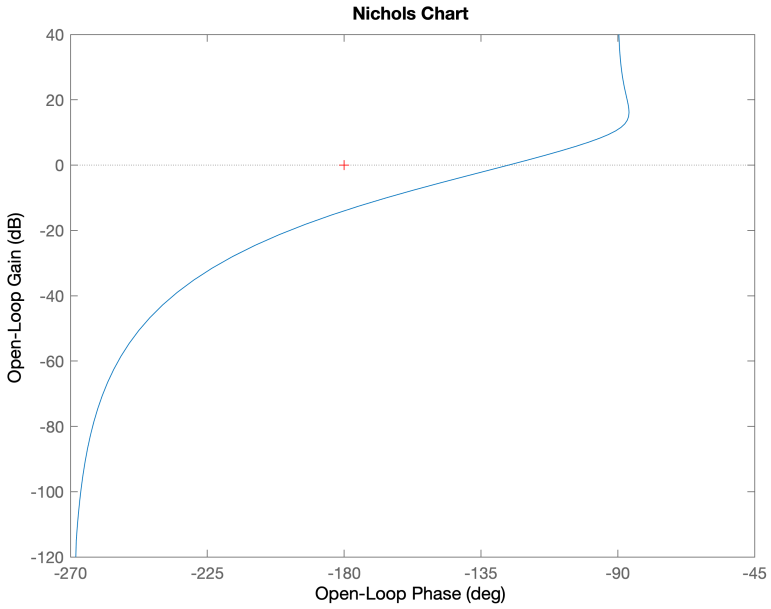
- system with controller step responde

Figure 15: system with controller step responde



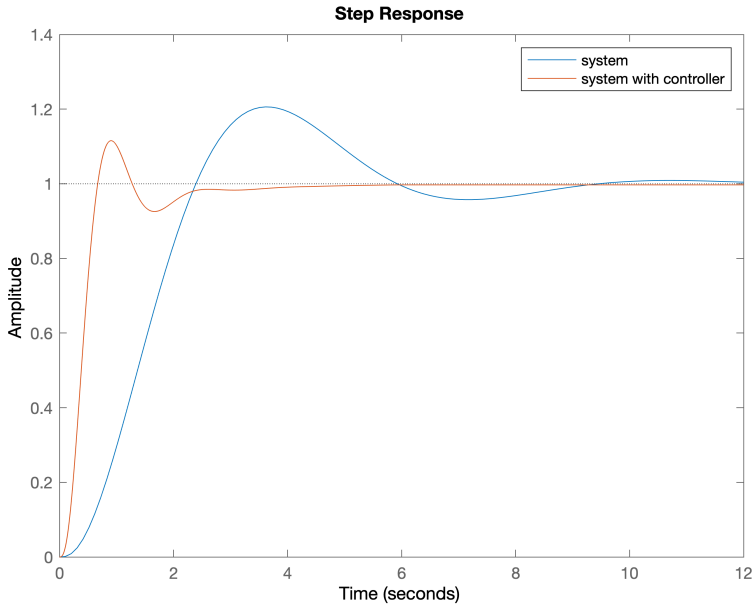
- system with controller nichols

Figure 16: system with controller nichols plot



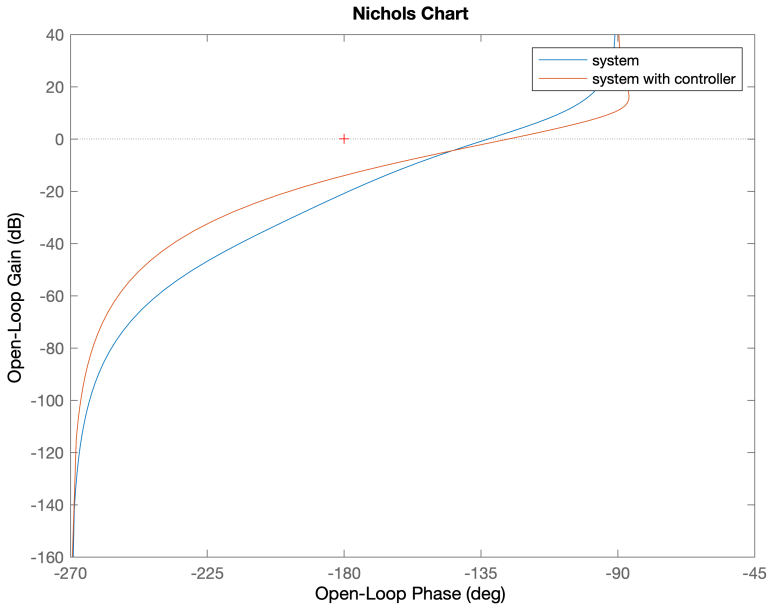
- system with and without controller step responde

Figure 17: system with and without controller step responde



- system with and without controller nichols

Figure 18: system with and withou controller nichols plot



4 Question 4

In this problem we use masserati ghibli data. For cancelling oscillation we use derivative controller to make overshoot low and increase gain to be fast enough with low overshoot.

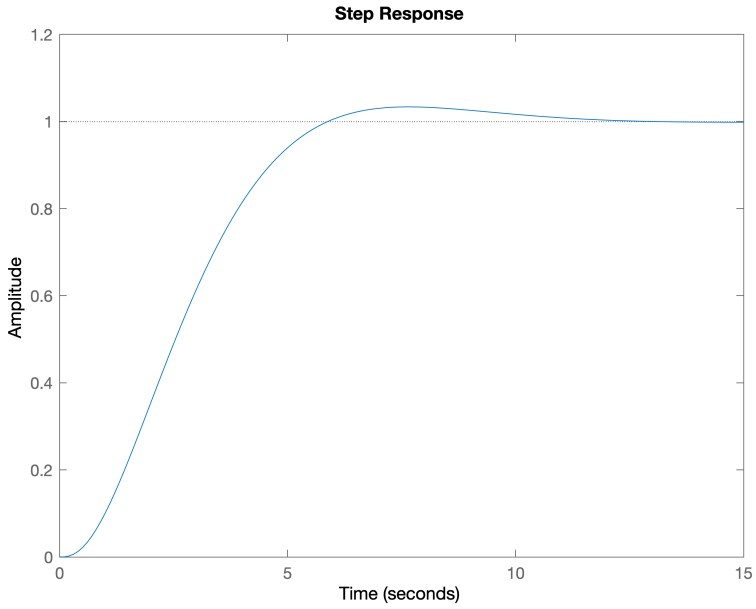
Table 1: Maserati ghibli data

Paramete	Unit	Value
M	kg	1900
C_d	1	0.29

In this problem we use

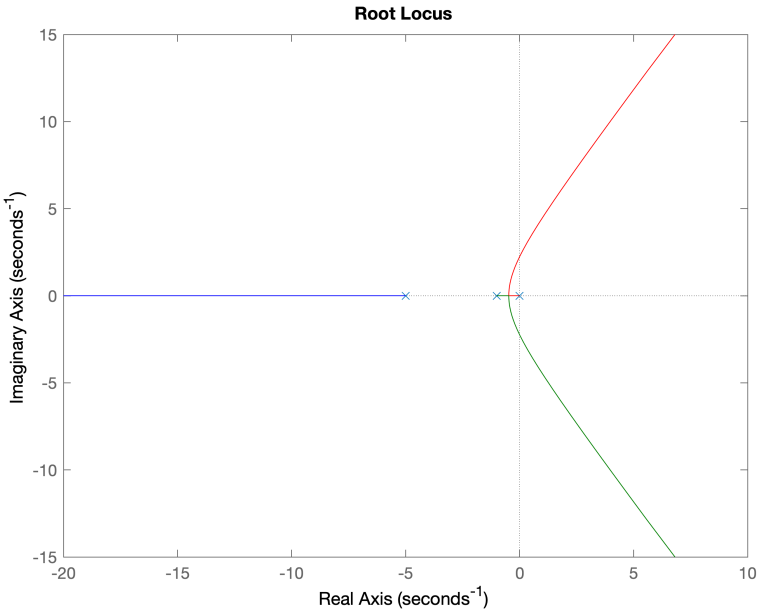
- system step responde

Figure 19: system step responde



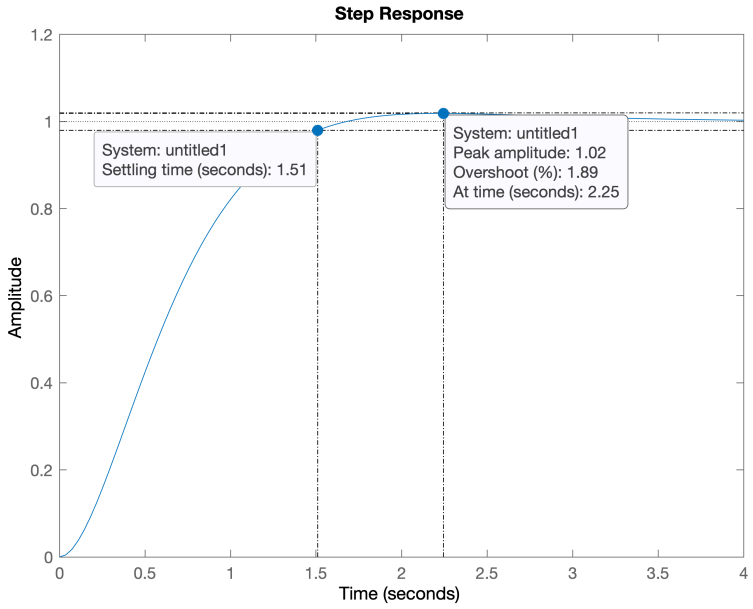
- system rlocus

Figure 20: system rlocus plot



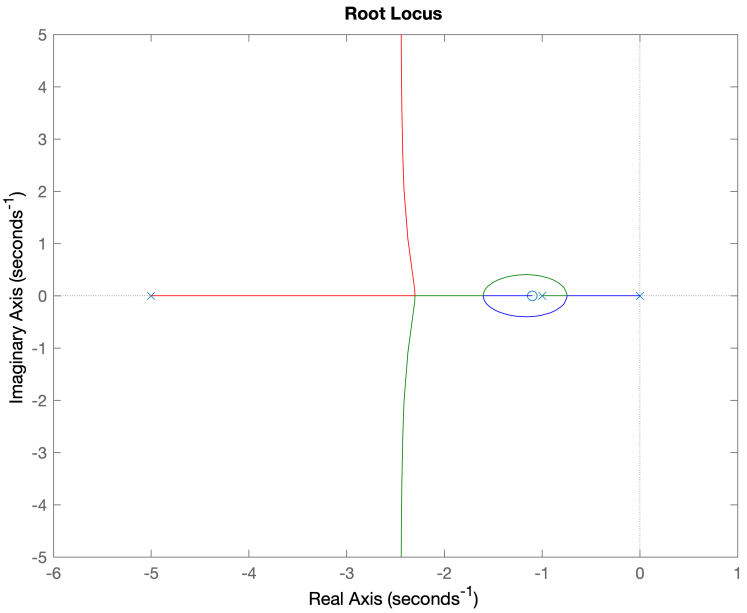
- system with controller step responde

Figure 21: system with controller step responde



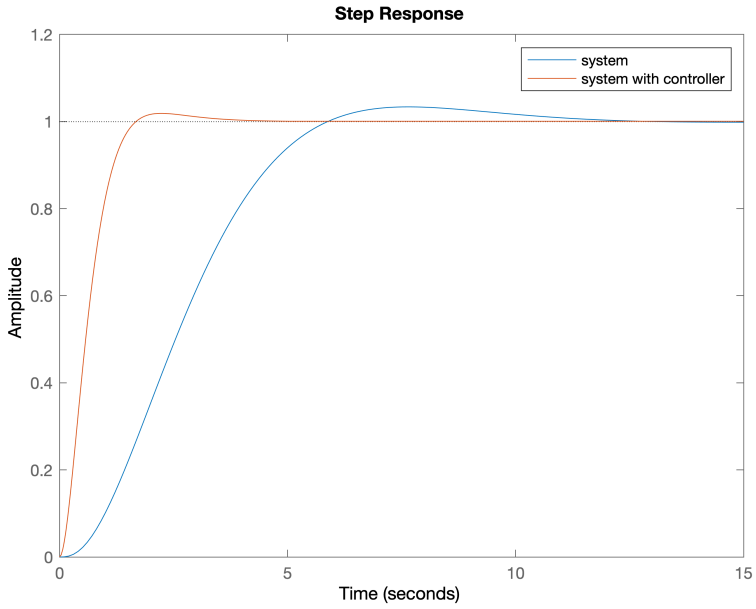
- system with controller rlocus

Figure 22: system with controller rlocus plot



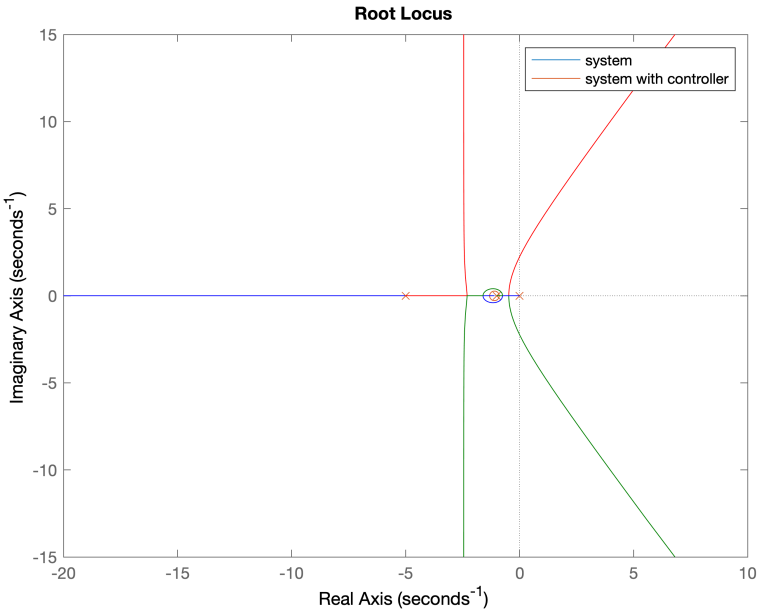
- system with and without controller step responde

Figure 23: system with and without controller step responde



- system with and without controller rlocus

Figure 24: system with and withou controller rlocus plot



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