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**Final Exam**

Control Engineering

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ITE

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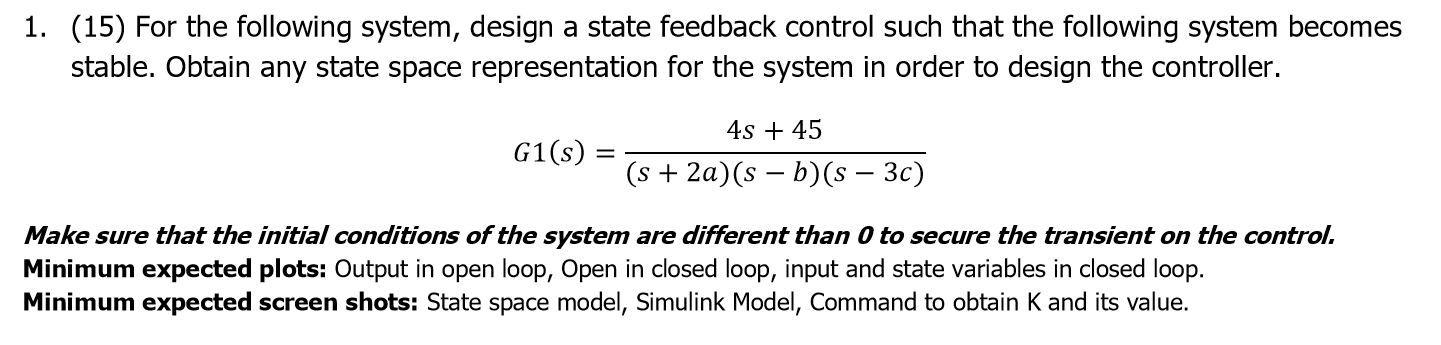
Zapopan, Jalisco, México.

June 6, 2020.

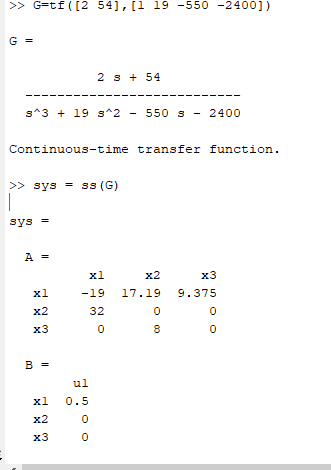
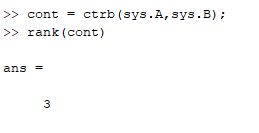
a = 10

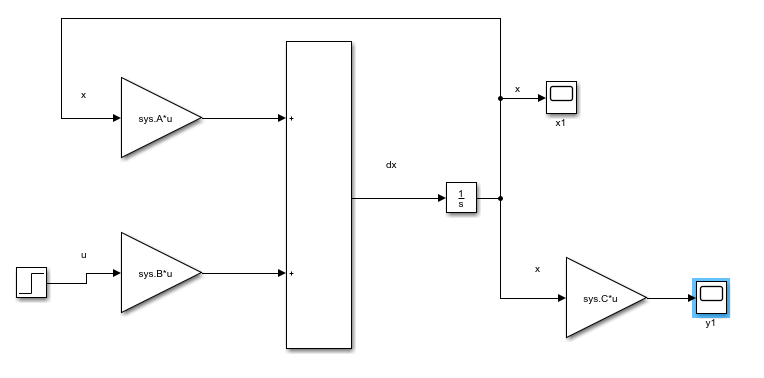
b = 5

c = 8

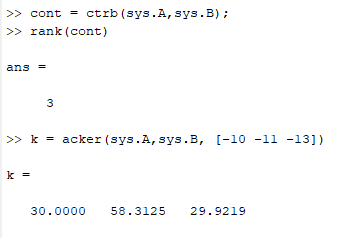


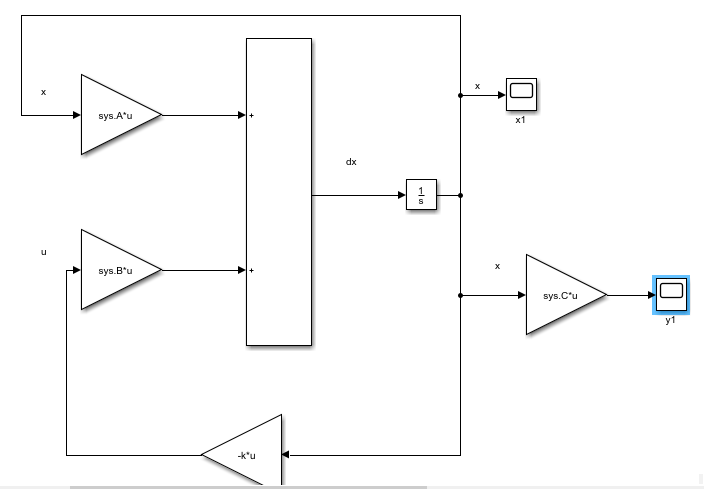
Problem 1:

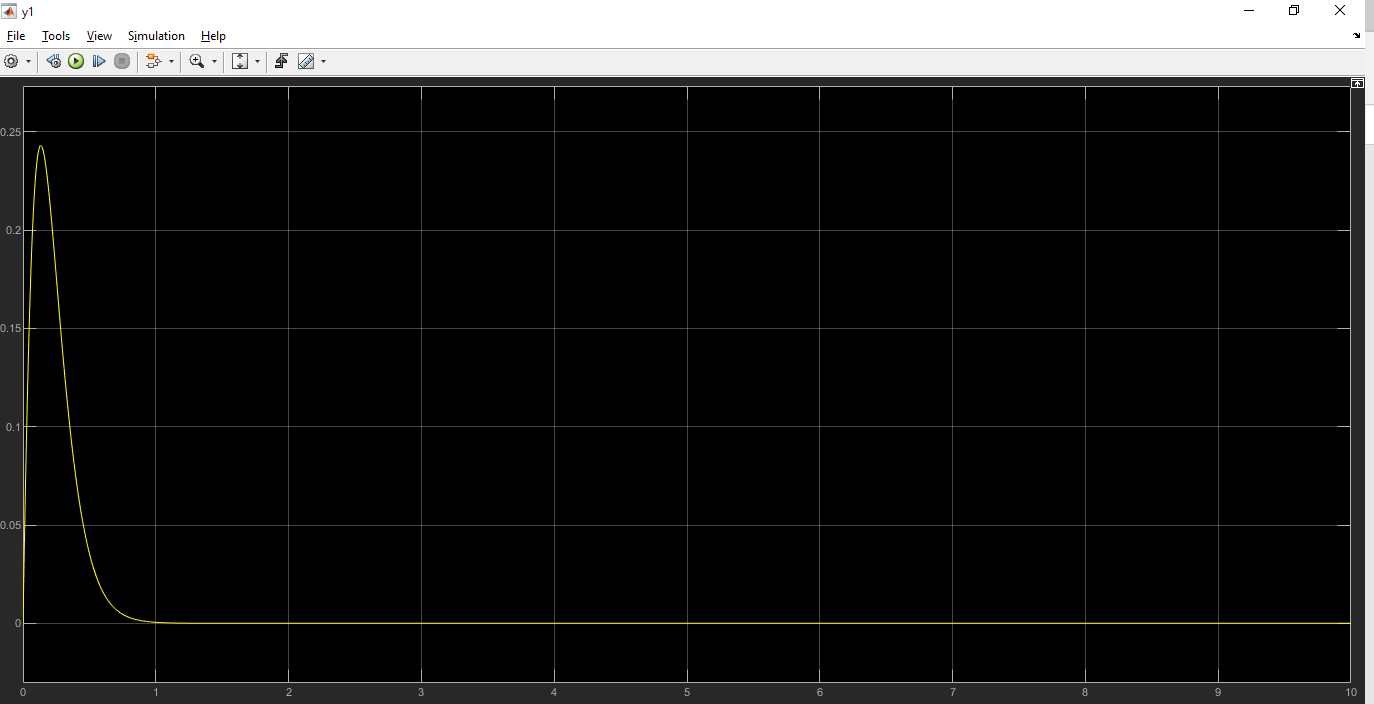
 It is controlable.

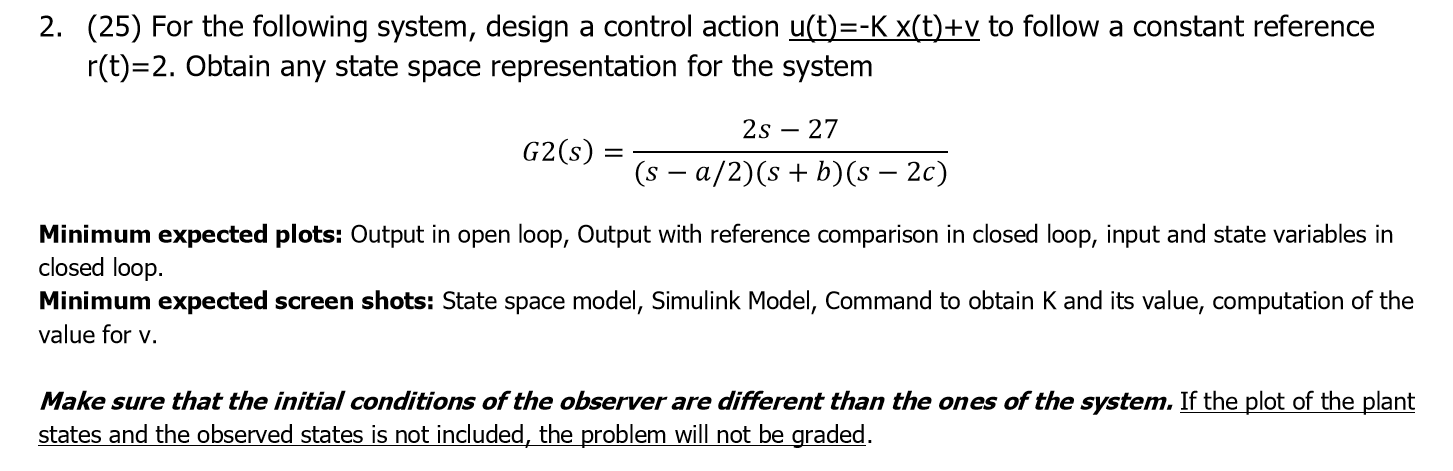




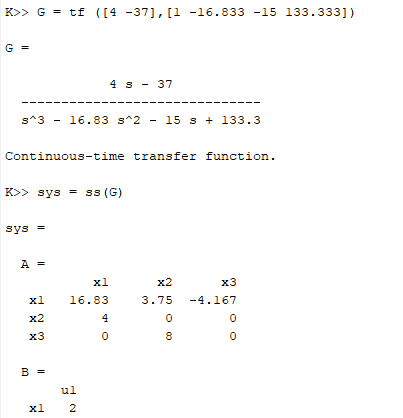


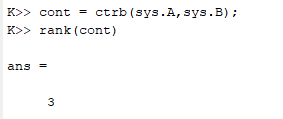


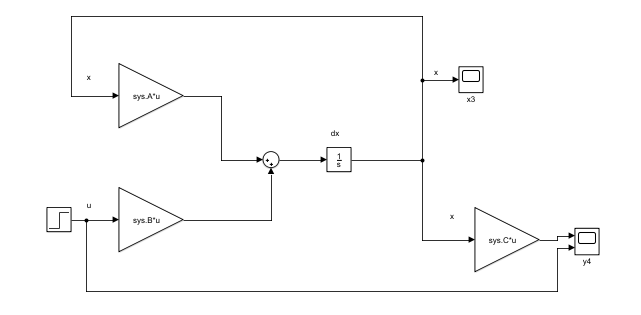


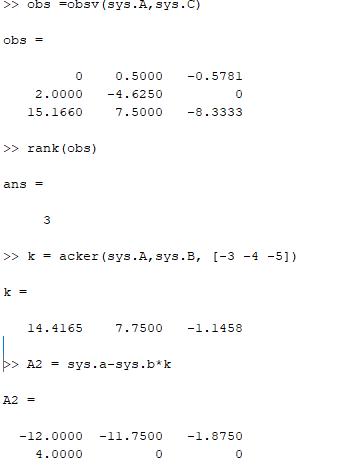


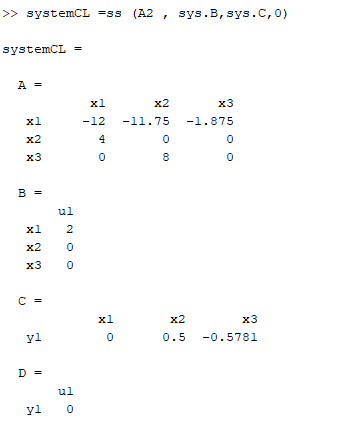
Problem 2:

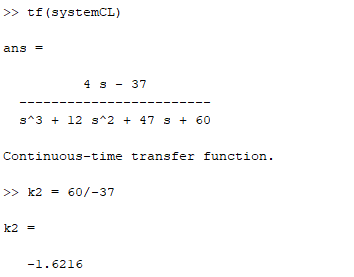


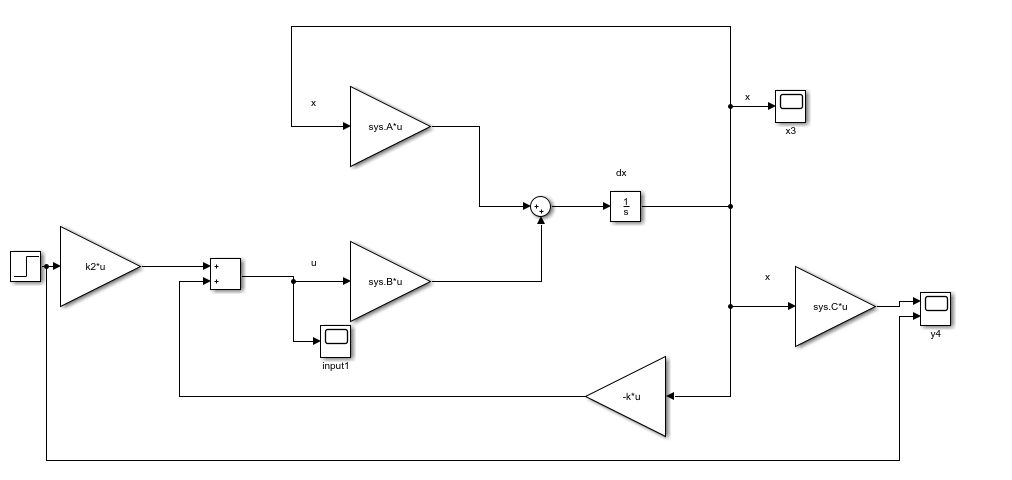
 It is controlable



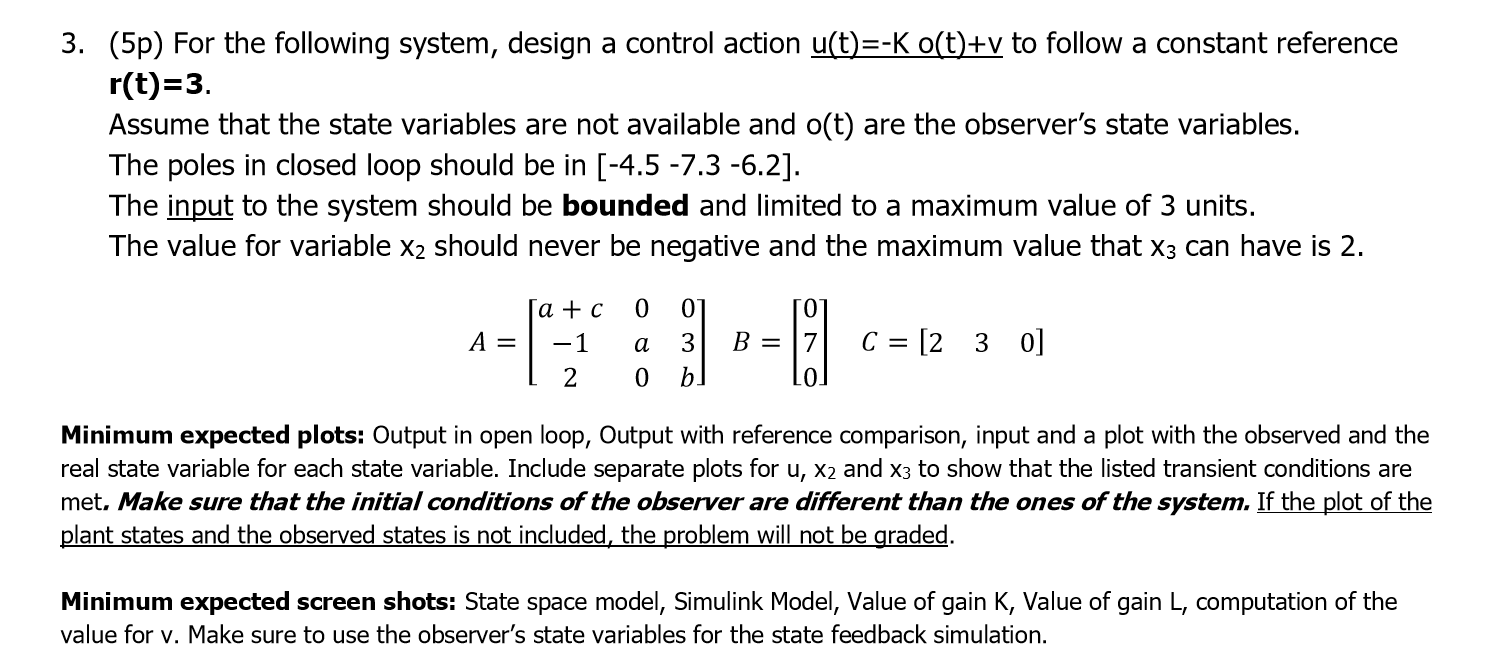




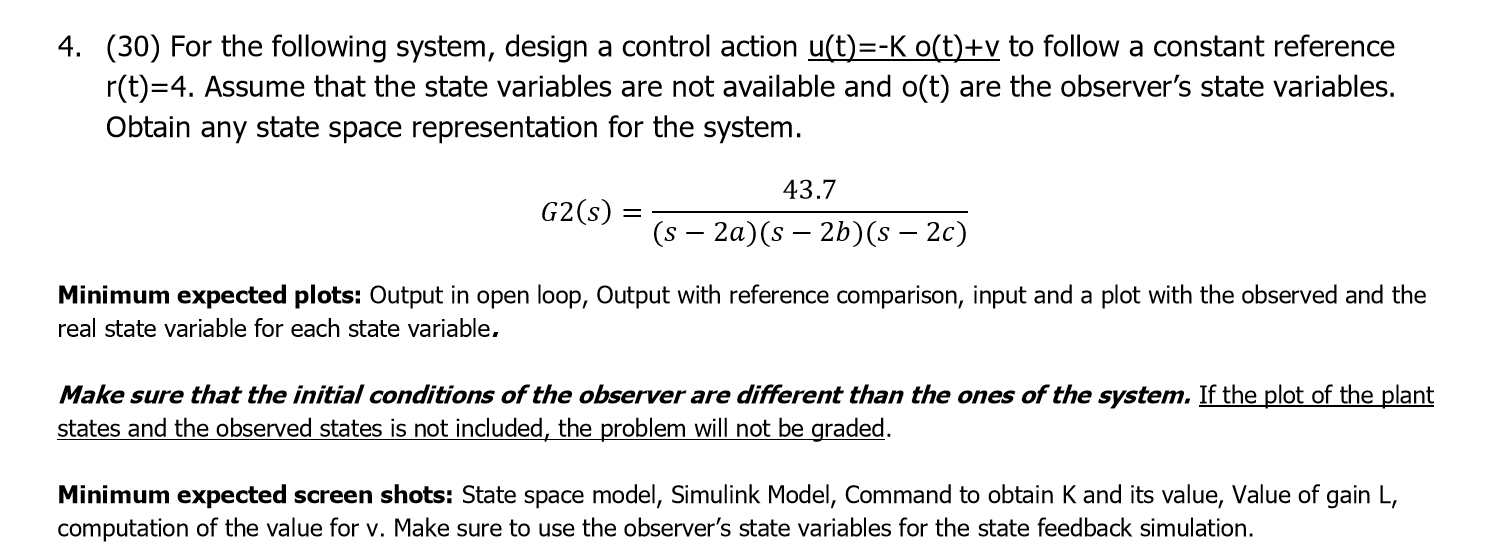




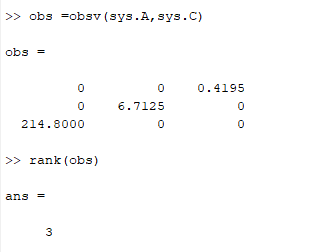
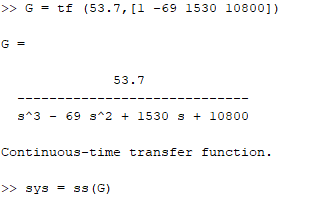




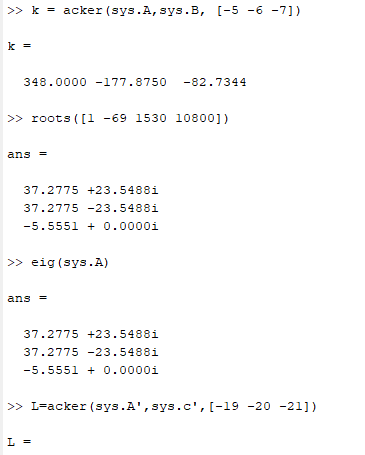
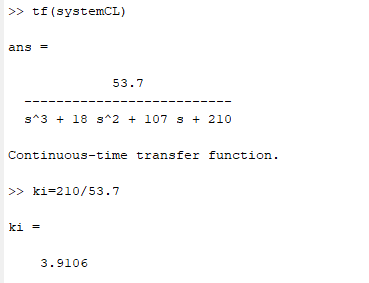
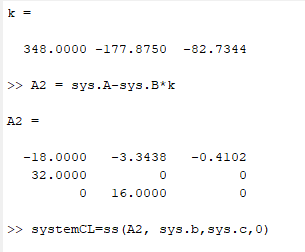
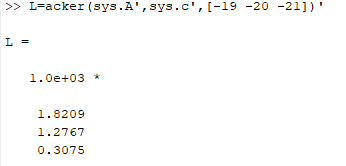
Problem 3:

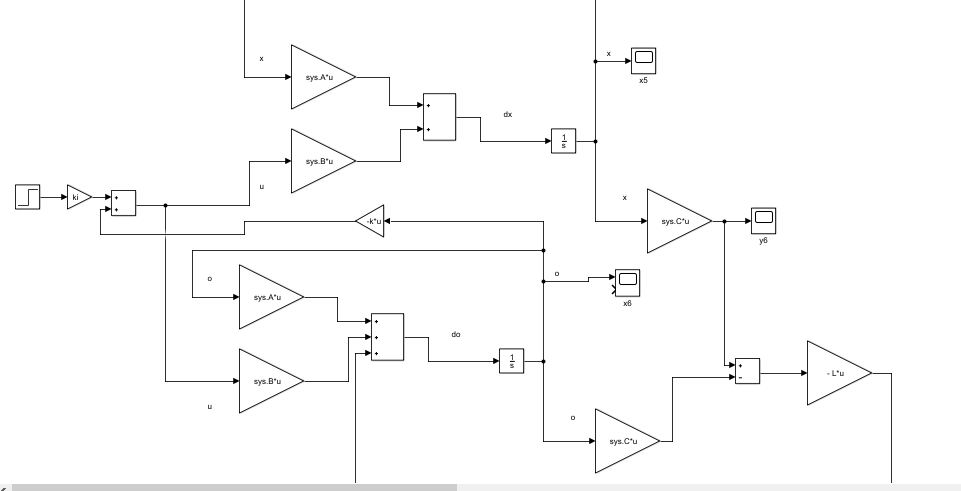


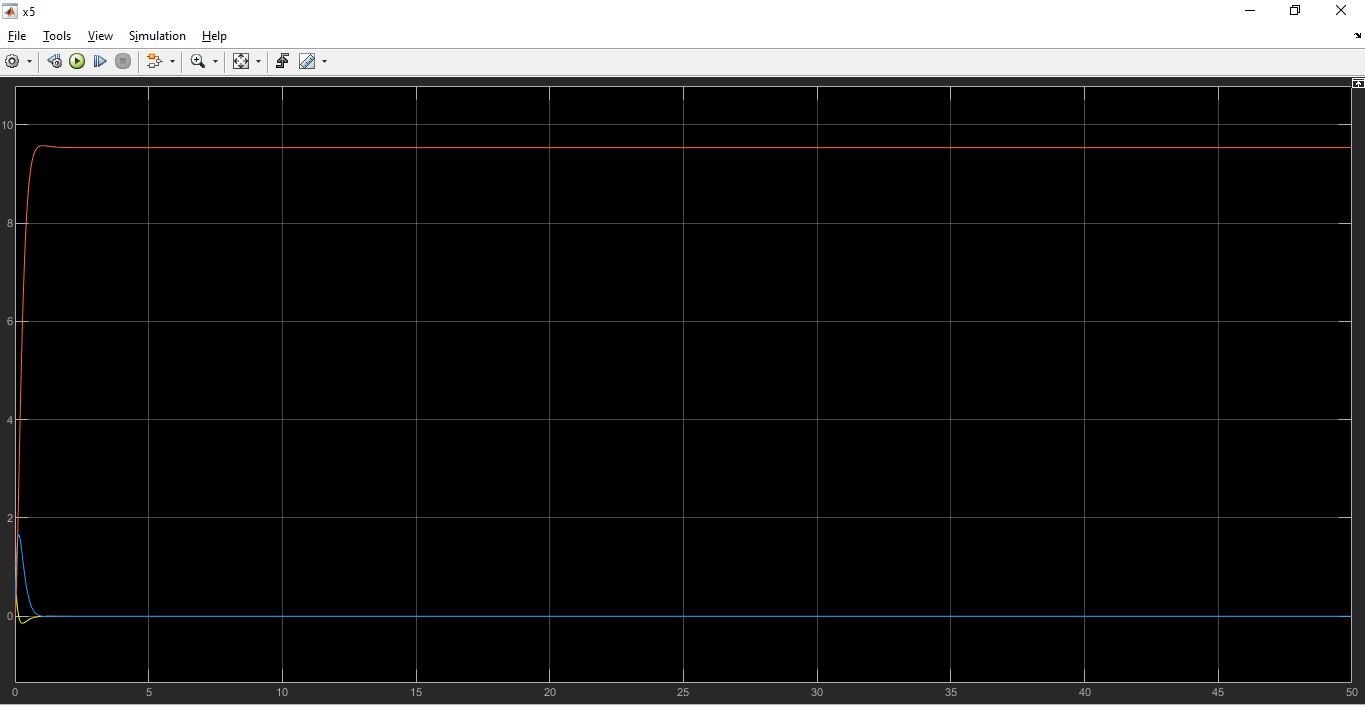
Problem 4:



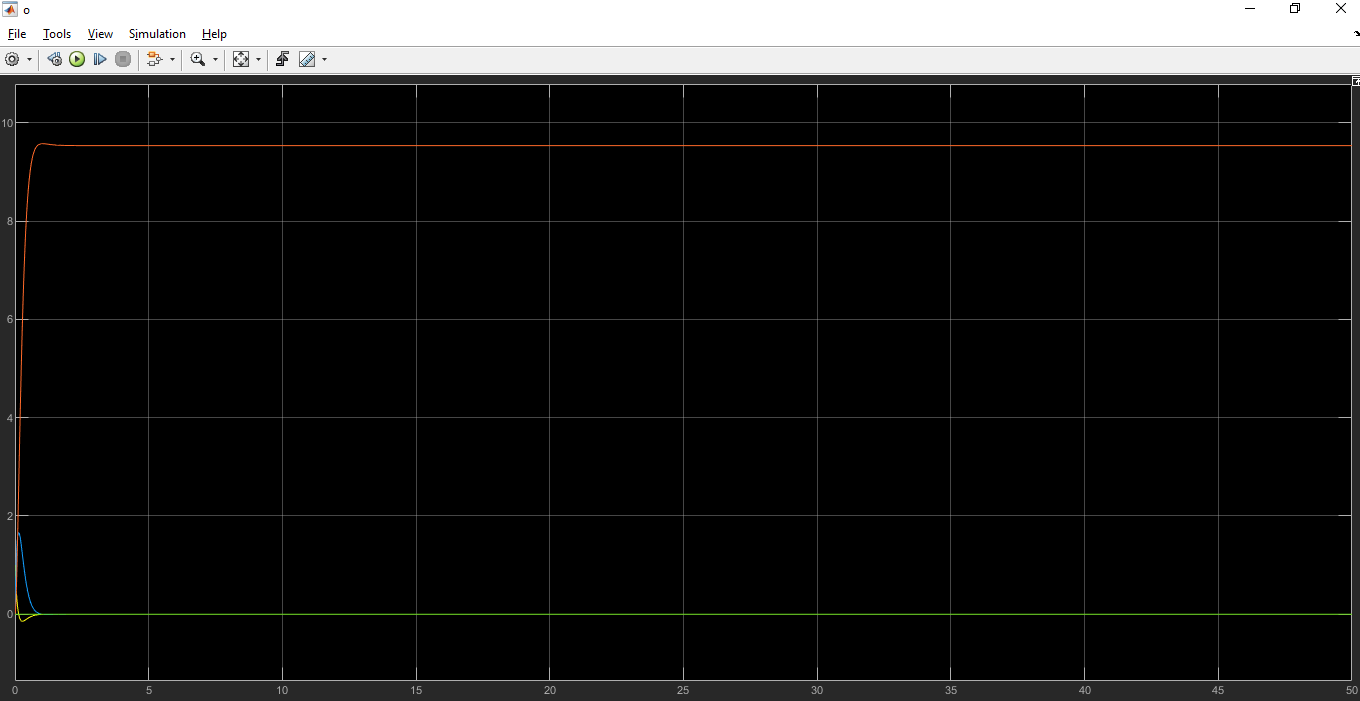
It is observable.

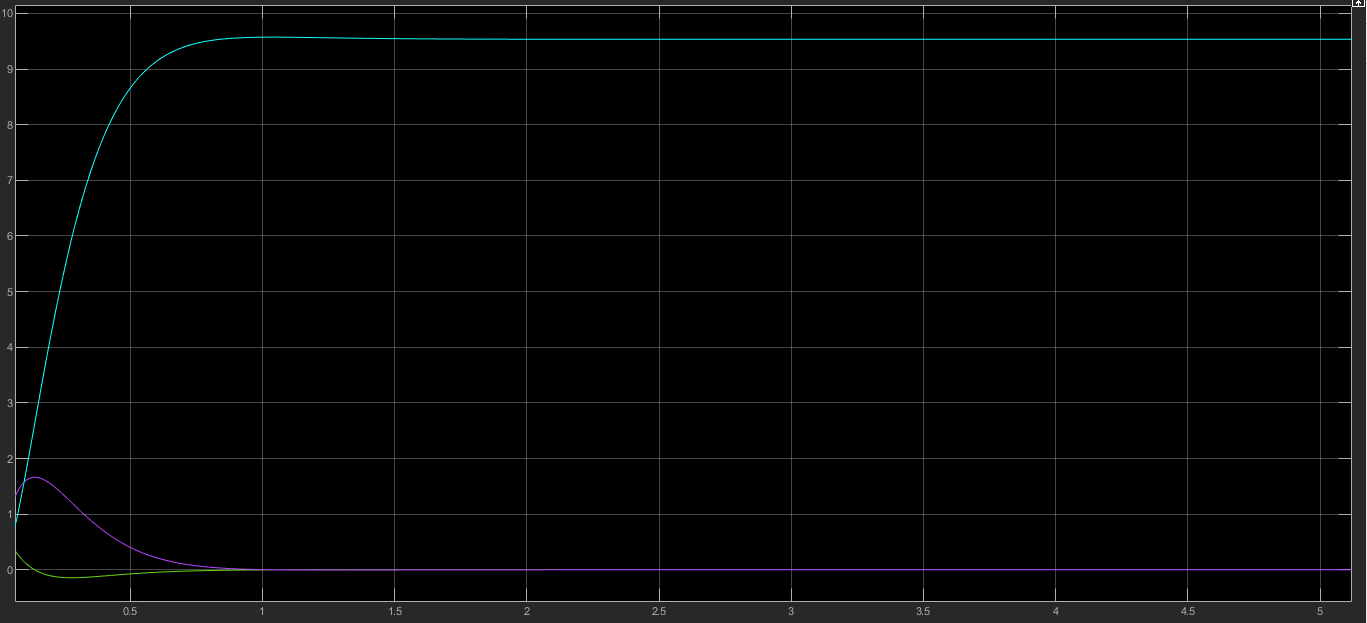
 

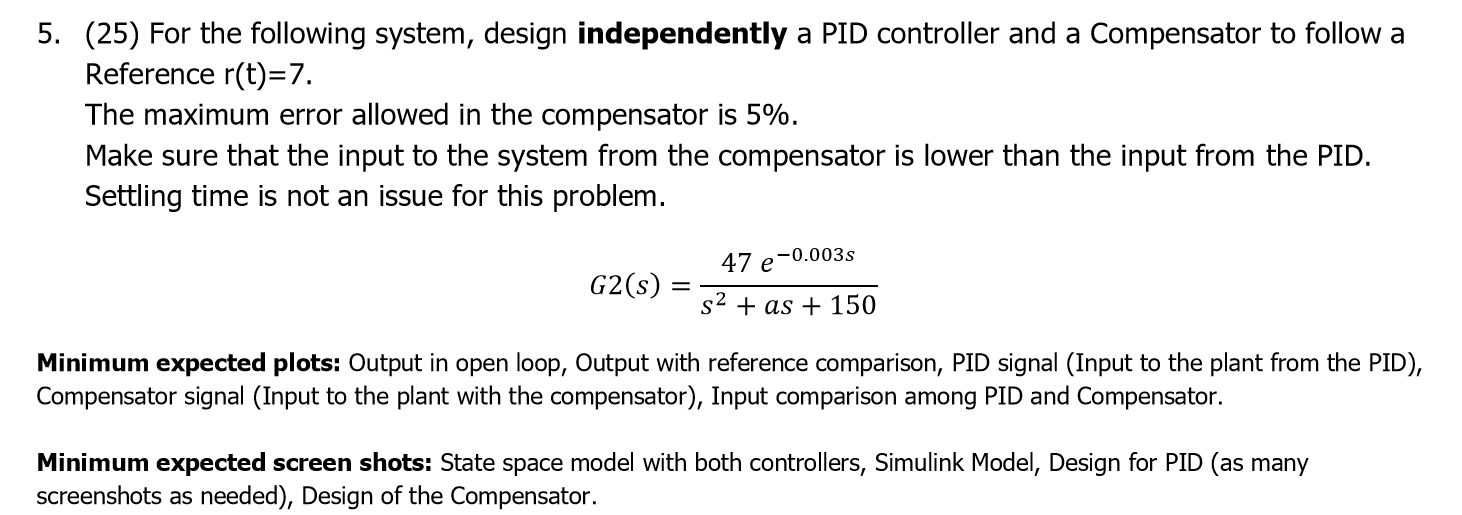


x= 

o=



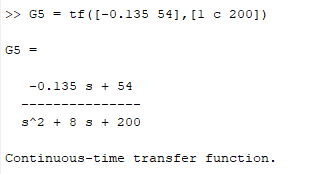
x and o

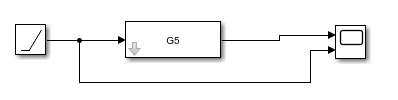


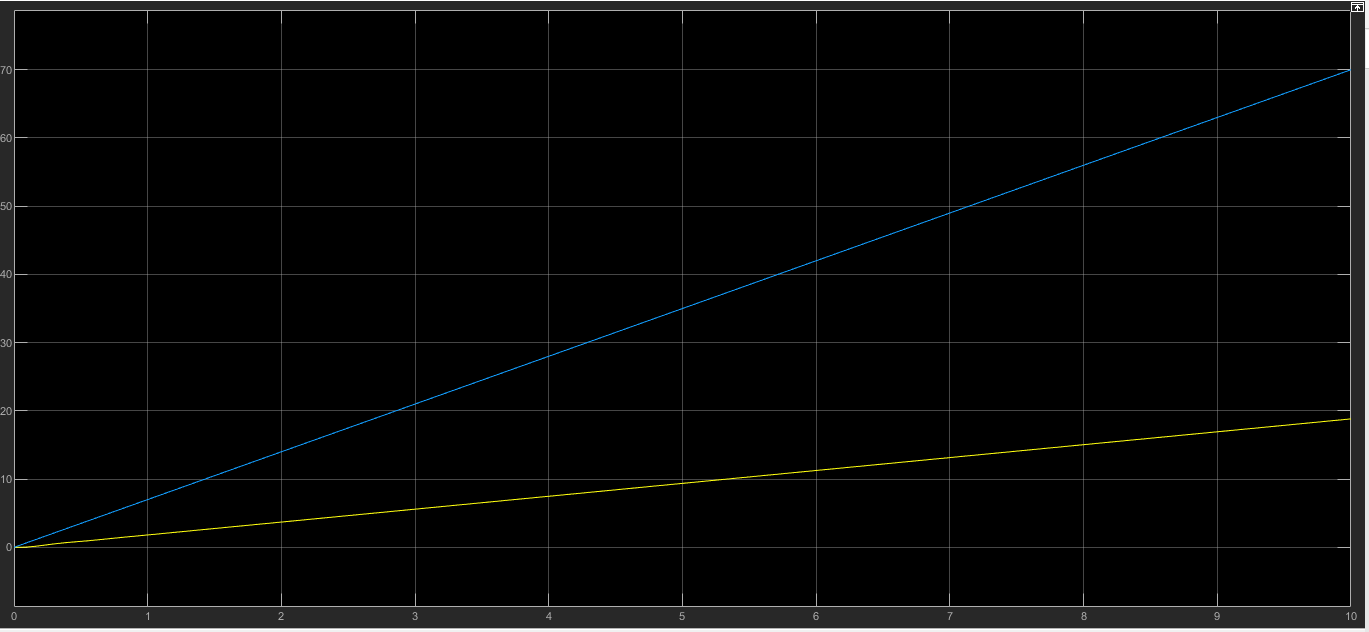
Problem 5:

e^-0.005 = (-0.005s/2 + 1) = -0.0025s +1

54 e^-0.005= 54(-0.0025s +1) = -0.135 s + 54



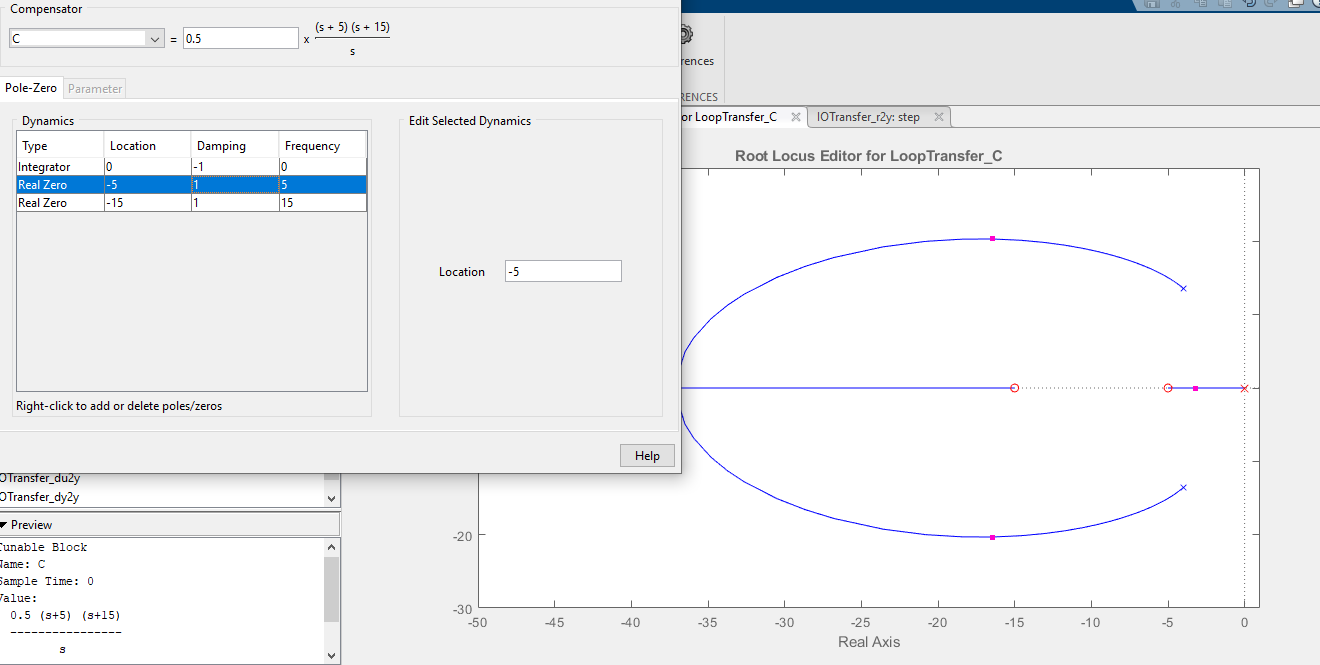




r(t) = 7

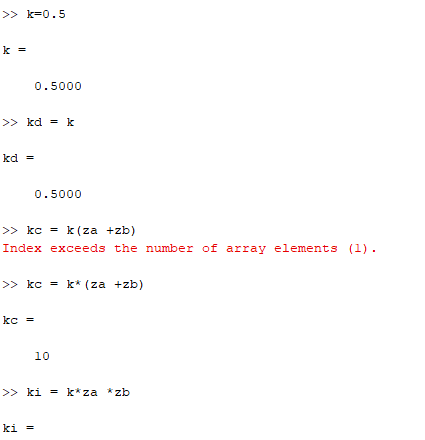
PID :

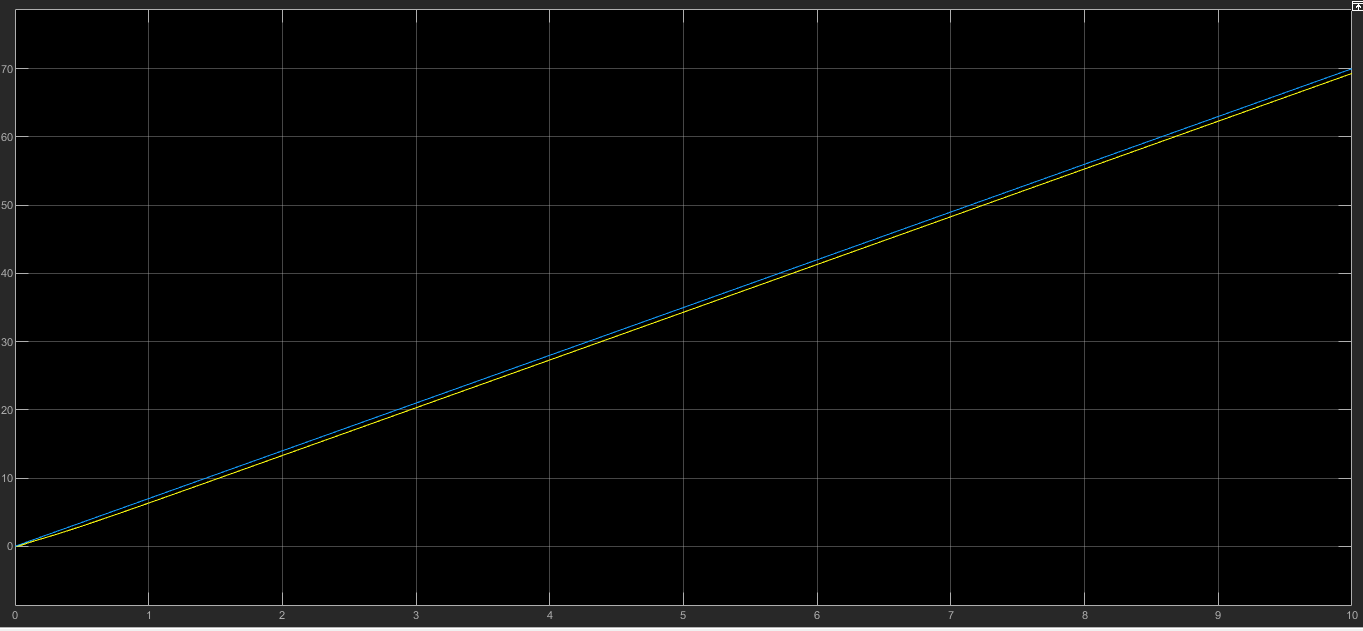
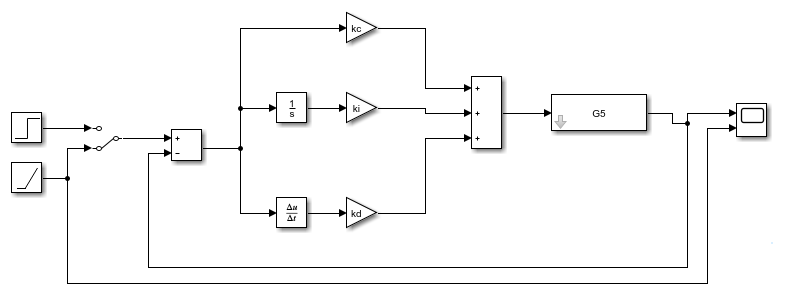
Add 1 Pole at zero and adding 2 zeros at -5 and -15



Gain = 0.5

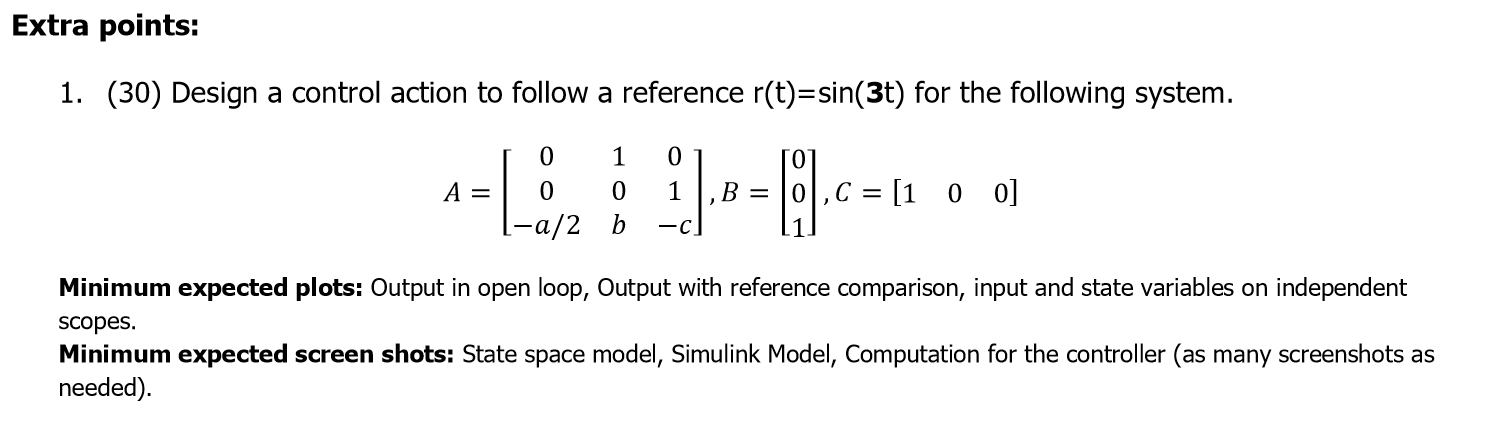
za = 5 zb =15 k = 0.5



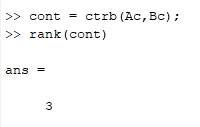


Compensator:

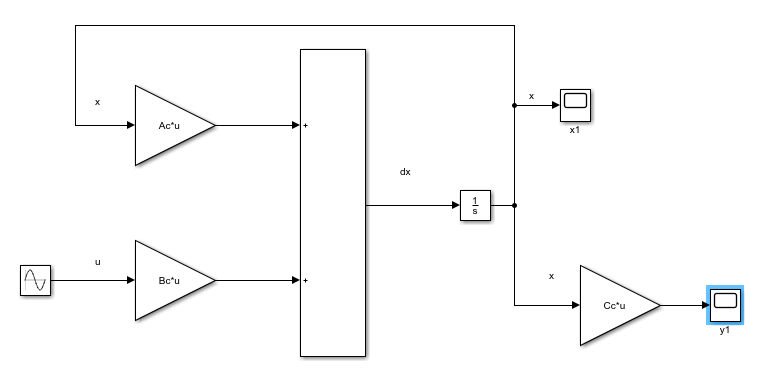
C(s) = k (s+a)/(s+b) therefore G(s)C(s) is type 0 unit ramp.  
Since the error of this problem tend to infinity, it is not possible make a maximum error as 5%, this problem cannot have a compensator.



Extra:

 It is controllable.

OL:





Calculations for controller:

