

XMUT315 Control Systems Engineering

Laboratory 1: System Modelling and Feedback Systems

Due Date: Not for submission

A. System Modelling

1. For the transfer function of a system as given below:

$$G(s) = \frac{a}{s^2 + 4s + a}$$

- Write a MATLAB m-file that will display the step response of this system for various values of $a = 1, 2, 4,$ and 8 . [20 marks]
- Plot the responses together on one graph. [10 marks]
- Comment on the results of your plots. [10 marks]

B. Feedback Systems

2. You are given a block diagram model of a control system as shown in Figure 1 below:

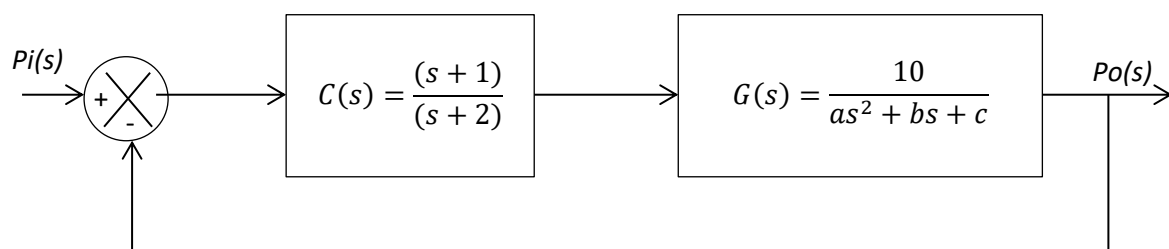


Figure 1: Block diagram of the control system

- a. Create a Simulink model of the above-given system (Hint: use the mask editor feature in Simulink for easy editing of the variables). [30 marks]
- b. In Simulink, plot the output (P_o) when the control system is subjected to a step input.
 - i. Case when $G(s)$: $a = 1$, $b = 2$, and $c = 4$. [10 marks]
 - ii. Case when $G(s)$: $a = 1$, $b = 2$, and $c = 0.5$. [10 marks]
- c. Comment on the differences that you observed in part (b) and relate your comment to the benefits of feedback application in the control system. [10 marks]

Note: Include all relevant MATLAB/Simulink files and screenshots of all MATLAB/Simulink simulations in your answer.

Marking Schedule

Student No : _____

Student Name : _____

No	Description	Mark	Yourk Mark	Remarks
A	<i>System Modelling:</i>			
1a.	MATLAB file for step response of system when $a = 1, 2, 4$, and 8 .	20		
1b.	Graph of step response.	10		
1c.	Comment on the plot in part (b).	10		
B	<i>Feedback Systems:</i>			
2a.	Simulink model of the system in MATLAB.	30		
2b.	Plot of output of the system in MATLAB when given a step input.			
i	Case when $G(s)$: $a = 1$, $b = 2$, and $c = 4$.	10		
ii	Case when $G(s)$: $a = 1$, $b = 2$, and $c = 0.5$.	10		
2c.	Comment of differences in part (b) and relation to benefit of feedback system.	10		
	Total	100		

Comments