NUST School of Electrical Engineering and Computer Science

Faculty Member:_____ Date: _____

Semester:_____ Section: _____

Department of Electrical Engineering

EE-379: Control Systems

LAB 8: Open Loop Control

Student name	Reg. No.	Lab Report Marks /10	Viva Marks / 5	Total/15

Objectives

i. Understanding the open loop control system
ii. Open loop control of DC Motor
iii. Open loop control of Inverted pendulum

Prerequisite

i. Lab 3 : System Modeling
ii. Lab 4 : Data Acquisition
iii. Lab 5: System response
iv. Lab 6: Model Verification

Open Loop Control of DC Motor

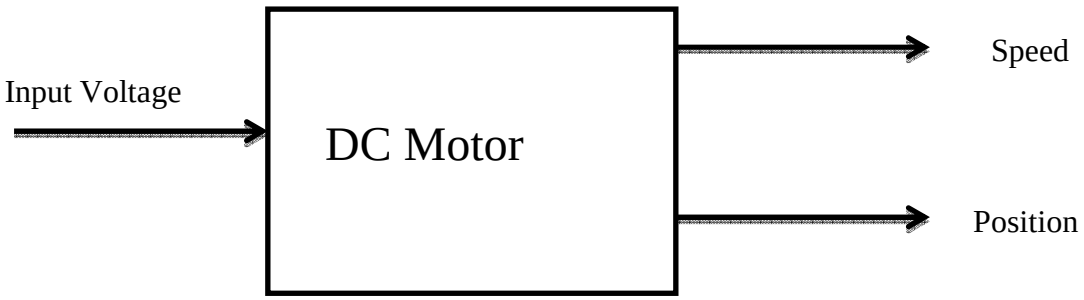

Figure 1: DC Motor Model

When we change the input voltage of DC motor its speed and position changes accordingly. Now we will see whether it is possible to control speed and position with no feedback (open loop).

Speed Control in Open loop

Exercise 1: Maintain the speed of 92rad/s by applying the required voltage (Use hit and trail method and note every voltage in your log book).

Exercise 2: Take the best reading from Exercise 1 and calculate the steady state response (for step input). Note all your calculations in Log book.

Exercise 3: Are the speedsobtained by experiment (exercise 1) and by calculation (exercise 2) same? If no what can be the possible reason.

Exercise 4: Apply the disturbance i.e. friction (by holding the motor with your hand) and try to maintain the desire speed. Comment on the obtained response.

Position Control in Open loop

Exercise 5: Rotate the motor by 180^{o} by applying the required voltage (Use hit and trail method and note very voltage in your log book).

Exercise 6: Take the best reading from Exercise 5 and calculate the steady state response (for step input). Note all your calculations in Log book.

Exercise 7: Are the positions obtained by experiment (exercise 1) and by calculation (exercise 2) same? If no what can be the possible reason.

Exercise 8: Apply the disturbance i.e. friction (by holding the motor with your hand) and try to maintain the desire position. Comment on the obtained response.

Open Loop Control of Inverted Pendulum

When we change the input voltage of driving unit (DC Motor) of inverted pendulum,arm angle changes accordingly. Now we will see whether it is possible to stabilize the pendulum with no feedback (open loop).

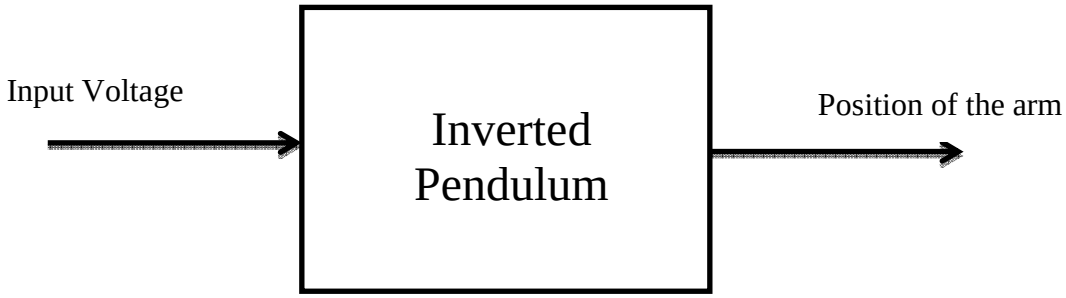

Figure 2: Inverted Pendulum Model

Exercise 9: Try to stabilize the pendulum by applying the required voltage. (Use hit and trail method and note very voltage in your log book).

Exercise 10: Take the best reading from Exercise 9 and calculate the steady state response (for step input). Note all your calculations in Log book.

Exercise 11: Why is it not possible to stabilize the inverted pendulum in open loop. (Hint: Plot pole-zero plot and comment)

Exercise 12: Why it is not possible to get the desired response in open loop with disturbance applied?