ACE 372: Digital Control Systems

Project Description

Instructions:

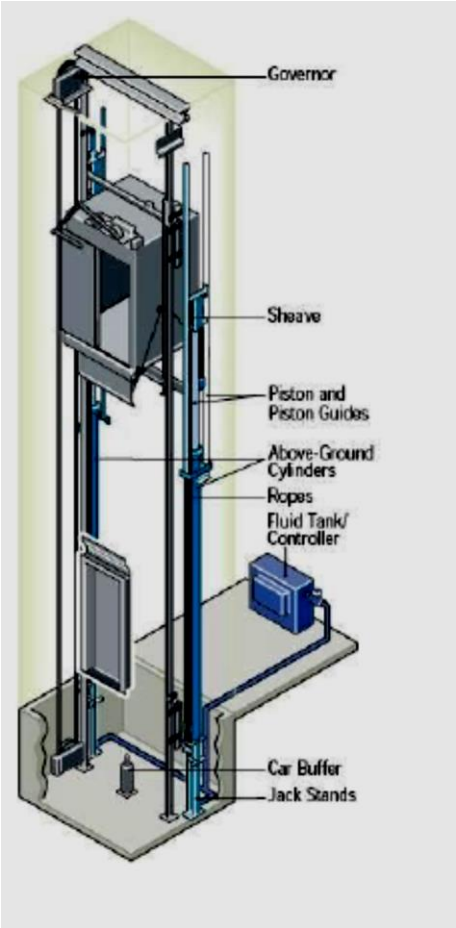
1. A full copy of the MATLAB code is attached in the appendix of the report.
2. A presentation is required to show the results of the project.

Objective:

The main objective of the project is to apply the main concepts of the course on real applications and collaborate effectively within a teamwork. There are some examples of real applications, it is required to design a digital controller for one of these dynamic systems.

System (1) Group (B)

Elevator Control



The system transfer function is:

$$\boldsymbol{G(s) = \frac{V(s)}{T(s)} = \frac{1}{(s^2 + 2s + 11)}}$$

Where:

$\boldsymbol{V(t)}$ **is elevataor velocity**

$\boldsymbol{T(t)}$ **is the input voltage**

1- Simulate the open loop time response of the system.

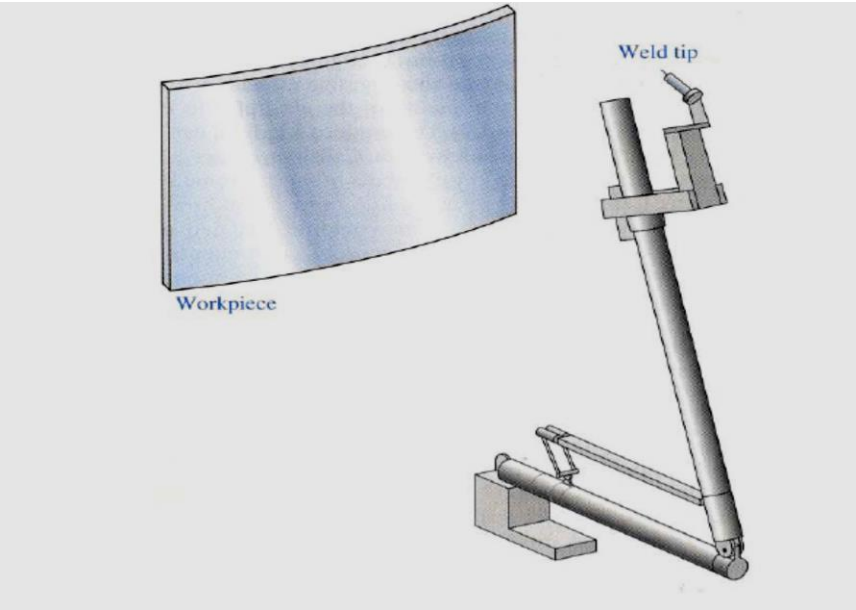
2- Using a microcontroller chip, design :

i) A suitable Digital PID controller.

ii) A suitable Dahlin PID controller.

System (2) Group (A)

Welding Robot Control



The system transfer function is:

$$G(s) = \frac{\mathbf{V(s)}}{\boldsymbol{T(s)}} = \frac{\mathbf{25}(\boldsymbol{s}+\mathbf{1})}{(\boldsymbol{s}+\mathbf{5})(\boldsymbol{s}+\mathbf{20})}$$

Where:

$\mathbf{V(t)}$ **is the robot velocity**

$\boldsymbol{T(t)}$ **is the torque input**

1- Simulate the open loop response of the system.

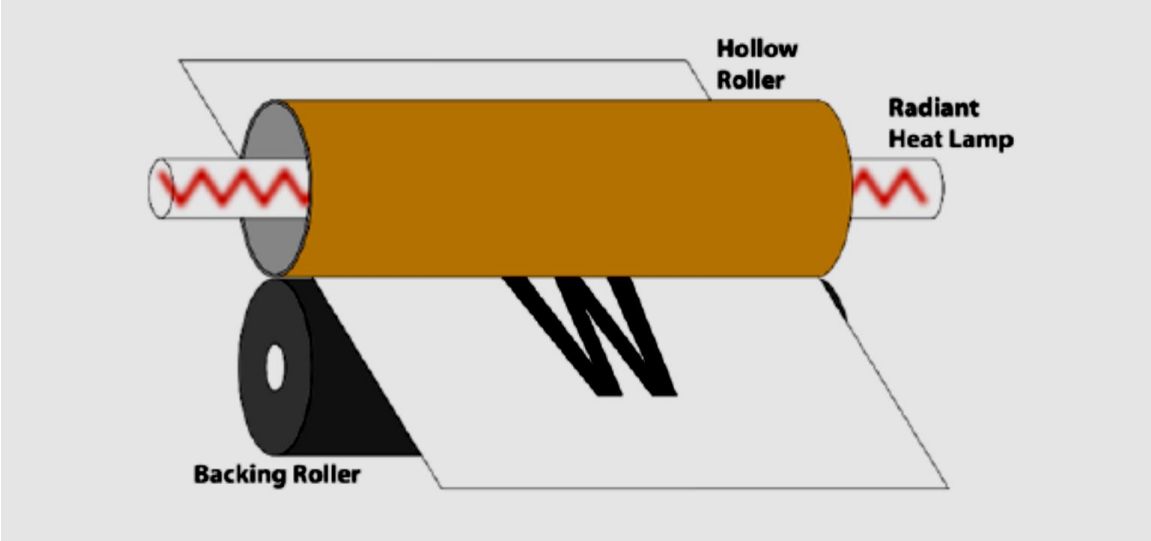
3- Using a microcontroller chip, design:

iii) A suitable Digital PID controller,

iv) A suitable Dahlin PID controller.

System (3) Group (C)

Laser Printer Positioning



The system transfer function is:

$$G(s) = \frac{\mathbf{Y(s)}}{\boldsymbol{T(s)}} = \frac{\mathbf{4}(\boldsymbol{s} + \mathbf{50})}{(\boldsymbol{s}^2 + \mathbf{30s} + \mathbf{200})}$$

Where:

$\mathbf{y\,(t)}$ **is printer displacement**

$\boldsymbol{T(t)}$ **is input control torque**

1- Simulate the open loop response of the system.

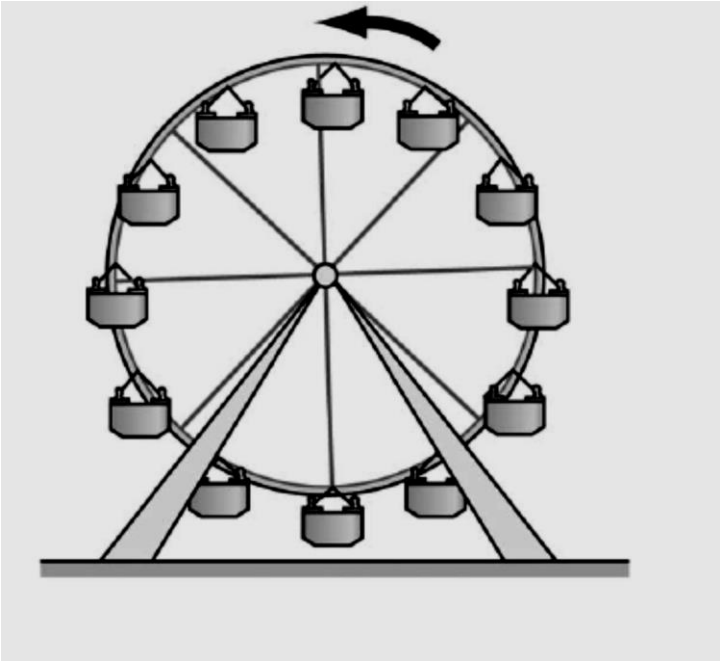
4- Using a microcontroller chip, design:

v) A suitable Digital PID controller.

vi) A suitable Dahlin PID controller.

System (4) Group (D)

Ferris Wheel Control



The system transfer function is:

$$G(s) = \frac{Y(s)}{T(s)} = \frac{(s+6)}{(s+4)(s+2)}$$

Where:

$\mathbf{y(t)}$ **is output angular velocity**

$\boldsymbol{T(t)}$ **is input control torque**

2- Simulate the open loop response of the system.

5- Using a microcontroller chip, design:

vii) A suitable Digital PID controller.

viii) A suitable Dahlin PID controller.