

MECH2210 (P3): VIBRATION OF 1DOF SYSTEM – ECP210

Visit this practical video on the Blackboard, PG-1: Section A, PG-2: Section B

MECH2210 P3: ECP210 Rectilinear Plant

Turn ON the controller after the PC is completed its reboot process

Open the ECP Dynamic Executive (3.2 bit) 5.6

Run as Administrator

Working files located at: C:\Program Files (x86)\ECP Systems\Dyn

(PD) File > Load Settings > (choose) Default.cfg

(PD) Utility > Download Personality File > (choose) m210di8.pmc

Observe: Disturbance Status' cell is available on the screen

SECTION A: FREE VIBRATION – DYNAMIC PARAMETER IDENTIFICATION

(PD) Command > Input Shape > (tick) Step > (click) Setup

Load: 0 N

Dwell time: 3000 msec

Reps: 1

(PD) Setup > Setup Driving Function > (tick) Force (Torque)

(soft reset) > (click) Disable Driving Function > (click) Enable Driving Function

(PD) Data > Setup Data Acquisition >

Sample Period: 2

Selected items: Drive Input, Encoder 1 Position

(PD) Plotting > Setup Plot >

Left Axis: Encoder 1 Position

Right Axis: (none)

(PD) Utility > (click) Zero Position

(PD) Command > Execute > (displace mass 1 approx. 10 mm) > (click) Run > (release mass 1)

Observe: mass 1 is oscillated, and wait until it stops

Result:

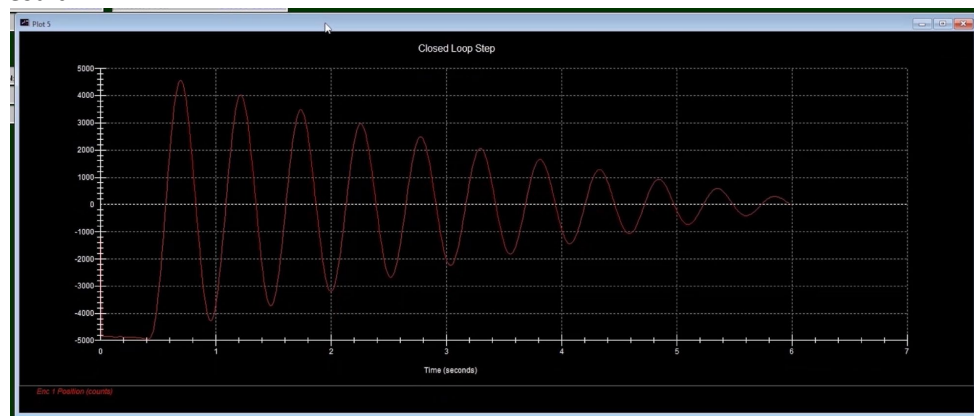


Figure 1. A typical step response is shown from the result

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SECTION B: DAMPED OSCILLATOR STEP RESPONSE UNDER, OVER & CRITICALLY DUMPED

(PD) Command > Input Shape > (click) Step > (click) Setup

Step size: 5 N

Dwell time: 3000 msec

Repetition: 1

(PD) Setup > Setup Driving Function > (click) Force + Spring + Damper > (click) Setup

$K = 0$

$c = 4.3$ (calculated value; section A)

(soft reset) > (click) Disable Driving Function > (click) Enable Driving Function

(PD) Utility > (click) Zero Position

(PD) Command > Execute > (click) Run

Observe: motor pushes mass 1 that then oscillated in two different amplitudes

(PD) Plotting > Plot Data >

Left Axis: Encoder 1 position

Right Axis: (none)

Result:

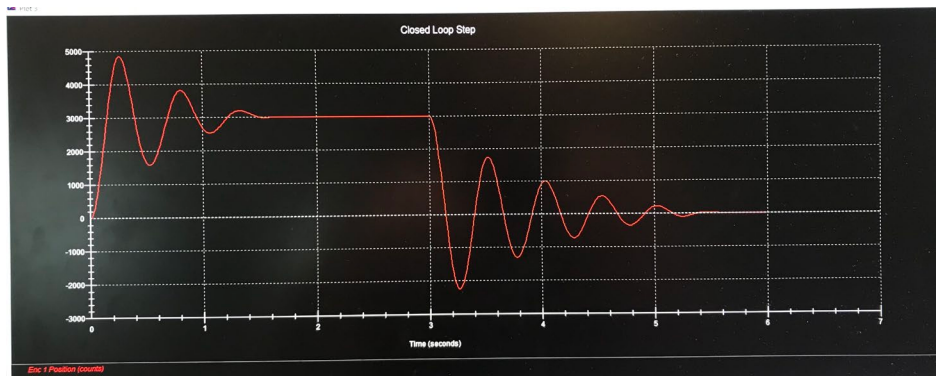


Figure 2. Two types oscillations due to combined damper setting

SECTION B-2:

(PD) Setup > Setup Driving Function > (click) Force + Spring + Damper > (click) Setup

$K = 0$

$c = 60.0$ (calculated value; a calculated from the previous minus the value in the system (?))

(soft reset) > (click) Disable Driving Function > (click) Enable Driving Function

(PD) Utility > (click) Zero Position

(PD) Command > Execute > (click) Run

Observe: motor pushes mass 1, stop and return no oscillation, reaching a steady state phase

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Result:

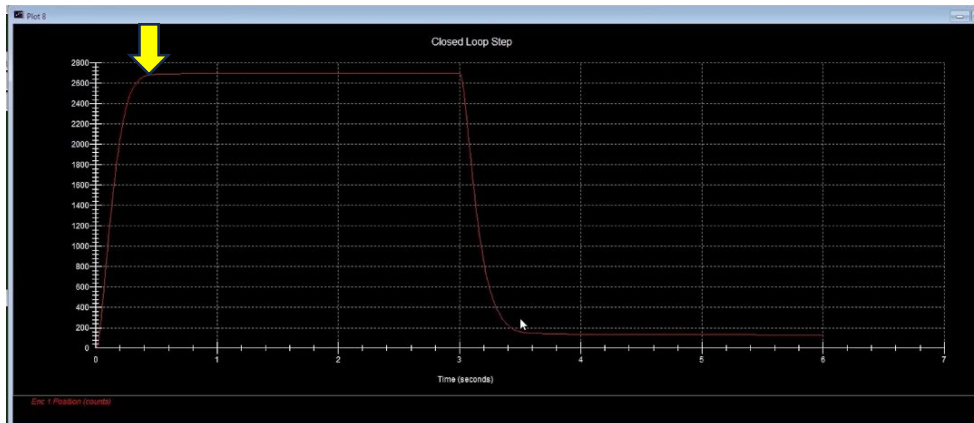


Figure 3. Mass-1 movement to reach its steady state phase

(PD) Setup > Setup Driving Function > (click) Force + Spring + Damper > (click) Setup

$K = 0$

$c = 152.6$ (calculated value)

(soft reset) > (click) Disable Driving Function > (click) Enable Driving Function

(PD) Utility > (click) Zero Position

(PD) Command > Execute > (click) Run

Observe: motor pushes mass 1 that takes longer time to reach a steady state value

Result:

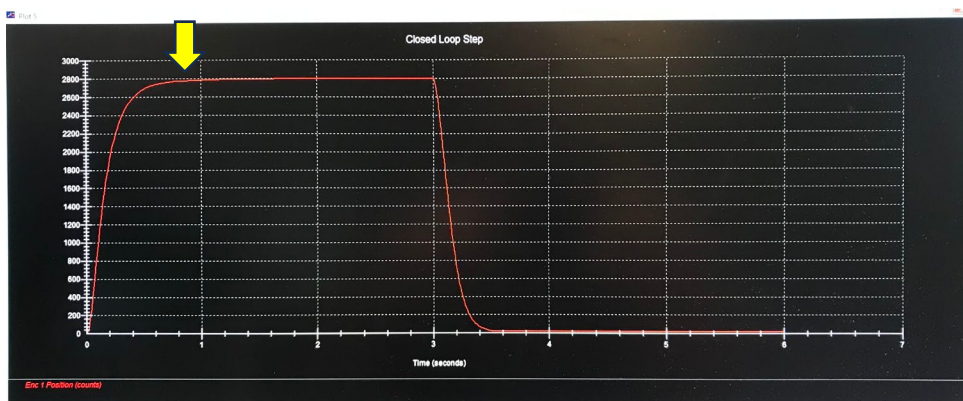


Figure 4. Mass-1 movement to *slowly* reach its steady state phase

This file is located at: G:\mats-lab\TEACHING AND LEARNING\Semester2\MECH2210 mechanical & space dynamics\

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