

Course outline

How does an NPTEL online course work?

Prerequisite Assignment

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

- Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 01

- Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 02

- Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 03

- Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 04

- Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 05

- Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 06

 Quiz : Assignment 9

- Variational Calculus and its applications in Control Theory and Nanomechanics : Week 9 Feedback Form

Week 10

Week 11

Week 12

Download Videos

Text Transcripts

Live Session

Assignment 9

The due date for submitting this assignment has passed.

Due on 2021-03-24, 23:59 IST.

As per our records you have not submitted this assignment.

- 1) A mechanical system is described by $\ddot{x}(t) = u(t)$ What will be its optimal control obtained by minimizing

1 point

$$J = \frac{1}{2} \int_0^5 u^2(t) dt$$

with the boundary conditions

$$x(t=0) = 2; x(t=5) = 0; \dot{x}(t=0) = 2; \dot{x}(t=5) = 0$$

- $u^*(t) = \frac{84}{125}t - \frac{25}{52}$
- $u^*(t) = \frac{84}{125}t - \frac{52}{25}$
- $u^*(t) = \frac{84}{25}t - \frac{52}{25}$
- $u^*(t) = \frac{84}{125}t + \frac{52}{25}$
- $u^*(t) = \frac{84}{125}t + \frac{25}{52}$
- $u^*(t) = -\frac{84}{125}t + \frac{52}{25}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $u^*(t) = \frac{84}{125}t - \frac{52}{25}$

- 2) Which of the following is/are the optimal control $u^*(t)$ of the plant

1 point

$$\begin{aligned} \dot{x}_1(t) &= x_2(t); x_1(0) = 3, x_1(2) = 0 \\ \dot{x}_2(t) &= -2x_1(t) + 5u(t); x_2(0) = 5, x_2(2) = 0 \end{aligned}$$

which minimizes the performance index

$$J = \frac{1}{2} \int_0^2 [x_1^2(t) + u^2(t)] dt$$

- $u^*(t) = 5\lambda_2^*(t)$
- $u^*(t) = \lambda_2^*(t)$
- $u^*(t) = -\lambda_2^*(t)$
- $u^*(t) = -5\lambda_2^*(t)$
- $u^*(t) = -3\lambda_2^*(t)$
- $u^*(t) = 3\lambda_2^*(t)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $u^*(t) = 5\lambda_2^*(t)$
 $u^*(t) = -5\lambda_2^*(t)$

- 3) For a second order system

1 point

$$\begin{aligned} \dot{x}_1(t) &= x_2(t) \\ \dot{x}_2(t) &= -2x_1(t) + 3u(t) \end{aligned}$$

with performance index

$$J = 0.5x_1^2(\pi/2) + \int_0^{\pi/2} 0.5u^2(t) dt$$

 with boundary conditions $x(0) = [0 \ 1]^T$ and $x(t_f)$ is free. What is/are the optimal control of the given system?

- $u^*(t) = 5\lambda_2^*(t)$
- $u^*(t) = \lambda_2^*(t)$
- $u^*(t) = -\lambda_2^*(t)$
- $u^*(t) = -5\lambda_2^*(t)$
- $u^*(t) = -3\lambda_2^*(t)$
- $u^*(t) = 3\lambda_2^*(t)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $u^*(t) = -3\lambda_2^*(t)$
 $u^*(t) = 3\lambda_2^*(t)$