

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

Week 10

 Constrained Optimization in Optimal Control Theory - Part 01

 Constrained Optimization in Optimal Control Theory - Part 02

 Constrained Optimization in Optimal Control Theory - Part 03

 Constrained Optimization in Optimal Control Theory - Part 04

 Constrained Optimization in Optimal Control Theory - Part 05

 Constrained Optimization in Optimal Control Theory - Part 06

 Variational Calculus and its applications in Control Theory and Nanomechanics : Week 10 Feedback Form

 Quiz : Assignment 10

Week 11

Week 12

Download Videos

Text Transcripts

Live Session

Assignment 10

The due date for submitting this assignment has passed.

Due on 2021-03-31, 23:59 IST.

As per our records you have not submitted this assignment.

1) Which of the following is/are the Hamilton-Jacobi-Bellman Equation for the system

1 point

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

with the performance index as

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

with boundary condition as

$$J(x(t_f), t_f) = S(x(t_f), t_f) = 0$$

- $J_t + \frac{1}{2}x_1^2(t) + J_{x_1}x_2(t) + J_{x_2}(2x_2(t) - 3x_1^2(t) - \frac{1}{2}J_{x_2}) = 0$
- $J_t + \frac{1}{2}x_1^2(t) + J_{x_1}x_2(t) + J_{x_2}(2x_2(t) + 3x_1^2(t) - \frac{1}{2}J_{x_2}) = 0$
- $J_t + \frac{1}{2}x_1^2(t) + J_{x_1}x_2(t) + J_{x_2}(-2x_2(t) - 3x_1^2(t) - \frac{1}{2}J_{x_2}) = 0$
- $J_t + \frac{1}{2}x_1^2(t) + J_{x_1}x_2(t) + J_{x_2}(3x_2(t) - 2x_1^2(t) - \frac{1}{2}J_{x_2}) = 0$
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- $J_t + \frac{1}{2}x_1^2(t) + J_{x_1}x_2(t) + J_{x_2}(-3x_2(t) - 2x_1^2(t) - \frac{1}{2}J_{x_2}) = 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$J_t + \frac{1}{2}x_1^2(t) + J_{x_1}x_2(t) + J_{x_2}(-2x_2(t) - 3x_1^2(t) - \frac{1}{2}J_{x_2}) = 0$$

2) The double integral plant

1 point

$$\begin{aligned} \dot{x}_1(t) &= x_2(t) \\ \dot{x}_2(t) &= u(t) \end{aligned}$$

is to be transferred from any state to the origin in minimum time with the state and control constraints as $|u(t)| \leq 1$ and $|x_2(t)| \leq 2$. What will be the optimal control law of the above system ?

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

- $u^*(t) = \begin{cases} 1 & \text{if } \lambda_2^*(t) < -1 \\ -\lambda_2^*(t) & \text{if } \lambda_2^*(t) > 1 \\ -1 & \text{if } -1 \leq \lambda_2^*(t) \leq 1 \end{cases}$
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No, the answer is incorrect.
Score: 0

Accepted Answers:

$$u^*(t) = \begin{cases} 1 & \text{if } \lambda_2^*(t) < -1 \\ -1 & \text{if } \lambda_2^*(t) > 1 \\ -\lambda_2^*(t) & \text{if } -1 \leq \lambda_2^*(t) \leq 1 \end{cases}$$