Chapter 2

Calculus of Variations and Optimal Control

Solution to Problem 2.1

The performance index is

$$J = \int_{0}^{2} [2x^{2}(t) + \dot{x}^{2}(t)]dt,$$

=
$$\int_{t_{0}}^{t_{f}} V(x(t), \dot{x}(t))dt$$

where

$$V = 2x^2(t) + \dot{x}^2(t), \quad t_0 = 0, \quad t_f = 2.$$

Using the Euler-Lagrange equation (2.3.15)

$$\left(\frac{\partial V}{\partial x}\right)_{\bullet} - \frac{d}{dt}\left(\frac{\partial V}{\partial \dot{x}}\right)_{\bullet} = 0 \longrightarrow$$

$$4x^{\bullet}(t) - \frac{d}{dt}\left(2\dot{x}^{\bullet}(t)\right) = 0 \longrightarrow$$

$$\dot{x}^{\bullet}(t) - 2x^{\bullet}(t) = 0.$$

Solving the previous equation

$$x^{\bullet}(t) = C_1e^{\sqrt{2}t} + C_2e^{-\sqrt{2}t}$$

Optimal Control Systems Problems And Solutions Manual

Wayne D. Gray

Optimal Control Systems Problems And Solutions Manual:

Optimal Control Brian D. O. Anderson, John B. Moore, 2007-02-27 Numerous examples highlight this treatment of the use of linear quadratic Gaussian methods for control system design It explores linear optimal control theory from an engineering viewpoint with illustrations of practical applications Key topics include loop recovery techniques frequency shaping and controller reduction Numerous examples and complete solutions 1990 edition **Resilient Control Architectures and Power Systems** Craig Rieger, Ronald Boring, Brian Johnson, Timothy McJunkin, 2022-01-26 Master the fundamentals of resilient power grid control applications with this up to date resource from four industry leaders Resilient Control Architectures and Power Systems delivers a unique perspective on the singular challenges presented by increasing automation in society In particular the book focuses on the difficulties presented by the increased automation of the power grid The authors provide a simulation of this real life system offering an accurate and comprehensive picture of a how a power control system works and even more importantly how it can fail The editors invite various experts in the field to describe how and why power systems fail due to cyber security threats human error and complex interdependencies They also discuss promising new concepts researchers are exploring that promise to make these control systems much more resilient to threats of all kinds Finally resilience fundamentals and applications are also investigated to allow the reader to apply measures that ensure adequate operation in complex control systems Among a variety of other foundational and advanced topics you ll learn about The fundamentals of power grid infrastructure including grid architecture control system architecture and communication architecture The disciplinary fundamentals of control theory human system interfaces and cyber security The fundamentals of resilience including the basis of resilience its definition and benchmarks as well as cross architecture metrics and considerations The application of resilience concepts including cyber security challenges control challenges and human challenges A discussion of research challenges facing professionals in this field today Perfect for research students and practitioners in fields concerned with increasing power grid automation Resilient Control Architectures and Power Systems also has a place on the bookshelves of members of the Control Systems Society the Systems Man and Cybernetics Society the Computer Society the Power and Energy Society and similar organizations

Scientific and Technical Aerospace Reports ,1993 Applied Mechanics Reviews ,1974 Modern Control

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Partial contents The Laplace transform Mathematical modelling of dynamic system Transient response analysis Root locus

analysis Frequency response analysis PID controls and introduction to robust control Control systems in state space Liapunov
stability analysis and quadratic optimal control Modern Control Engineering P.N. Paraskevopoulos,2017-12-19

Illustrates the analysis behavior and design of linear control systems using classical modern and advanced control techniques
Covers recent methods in system identification and optimal digital adaptive robust and fuzzy control as well as stability

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