

Chapter 2

Calculus of Variations and Optimal Control

Solution to Problem 2.1

The performance index is

$$\begin{aligned} J &= \int_0^2 [2x^2(t) + \dot{z}^2(t)] dt, \\ &= \int_{t_0}^{t_f} V(x(t), \dot{z}(t)) dt \end{aligned}$$

where

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

Using the Euler-Lagrange equation (2.3.15)

$$\begin{aligned} \left(\frac{\partial V}{\partial x} \right)_* - \frac{d}{dt} \left(\frac{\partial V}{\partial \dot{x}} \right)_* &= 0 \longrightarrow \\ 4x^*(t) - \frac{d}{dt} (2\dot{z}^*(t)) &= 0 \longrightarrow \\ \dot{z}^*(t) - 2x^*(t) &= 0. \end{aligned}$$

Solving the previous equation

$$x^*(t) = C_1 e^{\sqrt{2}t} + C_2 e^{-\sqrt{2}t}$$

Optimal Control Systems Solution Manual

Christian G. Meyer



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Solutions Manual for Optimal Control Systems Laurie Kelly, 2004-02 **Digital Control Systems** Benjamin C. Kuo, 1980 **Optimal Control Engineering with MATLAB** Rami A. Maher, 2013 For control engineers optimal control is a tool to design a primal controller which secures system stability and fulfils a certain set of specifications via the optimisation of a specific performance index In this way troublesome trial and error controller tuning procedures are avoided The next step is to assess the possibility of practical implementation and this usually leads to a need to implement some controller trade offs To this end this book aims to construct bridges between conventional parameter optimisation and the methods of optimal control theory Optimal Control Engineering with Matlab teaches students efficiently how to apply the well known standard optimal control theory as well as recently developed methods for the practical implementation of optimal controllers for dynamic systems In this book the author uses his experience gained over twenty five years of teaching and supervising graduate and postgraduate students in many engineering specialisations to communicate the essentials of a very important branch of control system theory to a new generation of engineering students *Solutions Manual for Optimal Control Theory* Suresh P. Sethi, Gerald L. Thompson, 1981-11-30 **Optimal Control** Brian D. O. Anderson, 1990 *Optimal Control Systems* D. Subbaram Naidu, 2018-10-03 The theory of optimal control systems has grown and flourished since the 1960 s Many texts written on varying levels of sophistication have been published on the subject Yet even those purportedly designed for beginners in the field are often riddled with complex theorems and many treatments fail to include topics that are essential to a thorough grounding in the various aspects of and approaches to optimal control Optimal Control Systems provides a comprehensive but accessible treatment of the subject with just the right degree of mathematical rigor to be complete but practical It provides a solid bridge between traditional optimization using the calculus of variations and what is called modern optimal control It also treats both continuous time and discrete time optimal control systems giving students a firm grasp on both methods Among this book s most outstanding features is a summary table that accompanies each topic or problem and includes a statement of the problem with a step by step solution Students will also gain valuable experience in using industry standard MATLAB and SIMULINK software including the Control System and Symbolic Math Toolboxes Diverse applications across fields from power engineering to medicine make a foundation in optimal control systems an essential part of an engineer s background This clear streamlined presentation is ideal for a graduate level course on control systems and as a quick reference for working engineers **Servomechanisms: Bulletin of Automatic and Manual Control Abstracts** , 1967 [Modern Control System Theory and Design](#) Stanley M. Shinnars, 1998-05-06 The definitive guide to control system design Modern Control System Theory and Design Second Edition offers the most comprehensive treatment of control systems available today Its unique text software combination integrates classical and modern control system theories while promoting an interactive computer based approach to design solutions The sheer volume of practical

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