lems, and singular solutions are dealt with in some detail. The treatment of the linear servomechanism problem should appeal to the control engineer.

Chapter 6 discusses the discrete variational calculus and the discrete maximum principle. The technique developed in this chapter is of considerable importance. Discrete algorithms are easier to manipulate by hand, and they are more amenable to digital computer computations. Starting with the derivation of the discrete Euler–Lagrange equations, the authors proceed methodically to develop the discrete maximum principle, then compare the discrete and continuous maximum principle showing that the computational solutions are essentially the same, and finally investigate discrete optimal control and mathematical programming. Chapter 7 is the major coverage in the book which gives a valuable insight into the systems concepts. Outstanding in this chapter are the sections on sensitivity in optimum systems control and stability (both in-the-small and in-the-large). The remaining sections discuss observability in linear dynamic systems, and controllability in linear systems. Chapter 8 contains an account of optimum state estimation. This chapter develops the well-known Kalman–Wiener computational algorithms for nonstationary linear filtering. The modern approach of the "Kalman filter" is amenable to nonstationary recursive estimation problems where the signal to be estimated is the output of a dynamic time-varying linear system driven by white noise. Again here, and from this reviewers experience, the authors have done a fine job in presenting the material in terms that an engineer can understand. After a few mathematical preliminaries, the chapter covers the state-space formulation for systems with random inputs and minimum error variance linear filtering, the continuous-time and discrete-time Kalman filter, and the reconstruction of the state variables from output variables. The "Luenberger observer" is also treated briefly here. Chapter 9 is entitled "Combined Estimation and Control—the Linear Quadratic Gaussian (LQG) problem." After a general discussion, the chapter is devoted to the LQG problem for discrete and continuous cases, extensions of the LQG problem, and sensitivity analysis of combined estimation and control algorithms. All of these topics are treated in depth and detail. The last chapter, Chapter 10, contains several methods for solving optimal control problems. This is an excellent chapter for it summarizes the various computational methods available to the engineer. The computational methods discussed are discrete dynamic programming; gradient techniques for single-stage and multistage decision processes; optimization based on the second variation; and quasilinearization of continuous-time, discrete-time, and solutions of two-point boundary-value problems.

The book contains four useful appendices, which may serve as a reference to the student. Appendix A discusses the algebra, calculus, and differential equations of vectors and matrices. Appendix B is devoted to "Abstract Spaces." Appendix C treats random variables and stochastic processes. Appendix D develops the matrix inversion lemma. A well-documented list of references is provided at the end of each chapter.

This book is unique and invaluable and presents a balanced view of this many-sided subject. Thus the spectrum of backgrounds for the interested readership of this book is very broad indeed. The major merit of this book is that it successfully combines simplicity, physical intuition, and the ability to perform concrete calculations. There are some typographical errors, but the careful reader can easily detect them. The authors of this book provide an up-to-date well-written account of optimum systems control. For the reader who seeks an understanding of optimum systems control, this book can be highly recommended.

Power System Control and Stability—P. M. Anderson and A. A. Fouad (Ames, IA: Iowa State Univ., 1977, 464 pp.). *Reviewed by H. H. Happ, General Electric Company, Schenectady, NY 12345.*

This is volume 1 of a planned two-volume series on the subject. This book is without question the most outstanding text that has appeared on the subject of power system stability since the classic texts published more than 30 years ago. It is a well-written and detailed book that can serve as a classroom text as well as a reference volume. The book is at an advanced level and is therefore most suited for graduate work and as a reference source for practicing engineers and experts on the subject.

The book consists of nine chapters, five appendices, and an index. Numerous problems for homework appear at the end of each chapter as well as references for further study. Chapter 1 is entitled "Power System Stability" and serves to introduce the problem, the necessary definitions, and methods of solution. Chapter 2, entitled "The Elementary Mathematical Model," reviews the swing equations, the power-angle curve of a simple two-machine system, the classic representation of a synchronous machine in stability studies, and the equal area criterion still viewed as basic to this day. In Chapter 3, the system response to small disturbances is studied; a state-space approach is nicely introduced in this chapter by extending the conventional analysis of a simple machine against an infinite bus to a multimachine system.

The next three chapters consider detailed aspects of synchronous machine theory and their modeling. Chapter 4 presents a comprehensive summary of synchronous machine theory. Both exact as well as simplified models are derived. Chapter 5 entitled "The Simulation of Synchronous Machines" covers more practical considerations in the use of mathematical models such as the determination of initial conditions, how to obtain the required machine parameters from typical manufacturers' data, and the actual manner synchronous machines are modeled in both analog and digital simulations. Linear synchronous machine models are covered in Chapter 6. The following two chapters (7 and 8) discuss excitation systems and their effect on stability. An excellent summary of simplified to the sophisticated excitation systems is presented in Chapter 7. The effects of excitation on stability when a system is subjected to severe impacts (transient stability) as well as to small disturbances (dynamic stability) is covered in Chapter 8; the chapter also discusses supplementary stabilizing signals to improve system damping.

The last chapter, Chapter 9, covers multimachine systems. In this chapter, the authors chose to treat the loads as constant impedances for purposes of simplicity, which is justifiable for the purpose of this text. Both classic as well as more detailed machine representations are included. Five appendices and an index complete this superb text.

Optimization Methods—K. V. Mital (New Delhi: Wiley-Eastern, 1976, 253 pp.). *Reviewed by Vimal Singh, Department of Electrical Engineering, Motilal Nehru Regional Engineering College, Allahabad 211004, India.*

This book is an elementary introduction to optimization methods in operations research and systems analysis. It contains ten chapters. The first two chapters are about some related mathematical preliminaries such as Euclidean space, linear algebraic equations, convex sets, quadratic forms, and extrema of functions. The remaining chapters cover the main topics: linear programming, transportation problem, flow and potential in networks, nonlinear convex programming, dynamic programming, geometric programming, theory of games, and direct search and gradient methods. Only deterministic problems have been discussed.

The discussions are clear and to the point and, wherever necessary, illustrated by examples. The book contains, at the end of each chapter, a good number of unsolved problems.

The book contains 68 references all of which are books; the standard ones connected with the subject matter of a particular chapter are indicated in the form of a bibliographical note at the end of the chapter. Historical notes appear frequently. Thus the reader comes to know about the pioneer workers in the field.

The book is essentially self-contained, and most of the chapters can be studied independently of each other. Of course, it is assumed that the reader has some background in algebra, matrices, calculus, and geometry.

This book can serve as a suitable text for students of mathematics, operations research, engineering, economics, and management.