Economic interchange is well covered, but system security, a most important subject area today, is only mentioned in the chapter summary. Power system control is covered in Chapter 5. Frequency control, flat frequency, flat tie line, and the common tie line with frequency bias are well described.

Measurements of energy, energy accounting and inadvertent energy are described in Chapter 6. Telemetering methods, both analog and dispatch are covered in Chapter 7. System reliability factors are most lucidly covered in Chapter 8. Various factors that effect the reliability of a system are discussed such as spinning reserve, automatic load shedding, opening tie lines, restarting generation equipment, interconnections, etc. The basic principles of power system protection, better known as protective relaying, is covered well in Chapter 9. Basic relaying principles and the uses of a variety of relays such as inverse time relays, directional relays, power relays, and distance relays are described.

Power system stability is briefly reviewed in Chapter 10. Three modes of stability, steady state, transient, and dynamic, are briefly defined. EHV, both ac and dc, is the subject of the last chapter. A variety of subjects are covered here such as bundled conductors, line reactance compensation with series and shunt reactors, rectification and inversion, the advantages and disadvantages of dc transmission, and parallel operation of ac and dc.

Four appendices appear at the end of the book. The first appendix contains an introduction to trigonometry, and the second appendix describes the use of vectors in electric power engineering. The third appendix describes the revolving field, and the fourth, the control of power flow with phase shifting transformers. It would probably have been more appropriate if the material contained in the last two appendices could have been worked into the text material.

Suggestions for further study given by the author appear at the end of the book. They are insufficient, poorly chosen, and consist of eight sources, some of which are difficult to obtain. The classical texts have not been included.

In summary the book serves its stated purpose well and can also serve as text material in an introductory undergraduate course in power system operations.

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Stability Theory of Dynamical Systems—J. L. Willems (New York: Wiley; London: Nelson, 1970, 201 pp.)

The stability problem of dynamical systems is a field of intensive research in which new results are continually obtained, especially by mathematicians. At the same time the subject is of great interest to engineers and there is a constant need for books written for them containing an up-to-date exposition of the subject. The book on stability theory by Willems fulfills this need in a commendable way. In the course of seven chapters it gives a survey of methods of stability analysis of linear and nonlinear differential and difference equations.

The concepts of various forms of stability (viz. Lyapunov stability, Lagrange stability, input–output stability, etc.) and their mathematical significance in connection with the analysis of linear, nonlinear, time-invariant, and time-varying systems are discussed at the outset. This is followed by a chapter on Lyapunov's direct method in which stability and instability theorems for autonomous and nonautonomous systems are derived. A brief description of the principles underlying the methods of constructing Lyapunov functions is also given.

The well-known methods of stability analysis of linear systems possessing rational transfer functions using phase-plane techniques and the methods of Hurwitz, Routh, and Nyquist are described. Results concerning the applicability of the Nyquist criterion for systems possessing nonrational transfer functions are mentioned. The design of feedback systems with a prescribed degree of stability using Bode and root locus plots is discussed. The chapter on linear nonstationary systems reveals the difficulties involved in dealing with such systems. As the author points out, the formally straightforward methods known hereto are of limited value in practice.

The chapter on methods of dealing with nonlinear systems using Lyapunov theory and phase-plane techniques, as well as the more recently developed frequency domain methods due to Popov, Sandberg, etc., form an important part of the book. The final chapter gives methods of stability analysis for discrete systems.

In general, the topics dealt with have been selected with care. However, no mention is made of the method of describing functions widely used in the stability analysis of nonlinear control systems. The text is presented in a fluent style, and in spite of its mathematical rigor, rendered transparent by avoiding unnecessary sophistication. The prerequisites are kept to a minimum. The value of the book is greatly enhanced by copious references and problems at the end of each chapter. The book should be useful for students and practising engineers.

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Stability Theory—H. Leipholz (New York: Academic Press, 1970, 277 pp.) (A translation of the first German edition, Stuttgart: B. G. Teubner, 1968.)

Most of the theory that is presented deals with perturbations of the initial conditions or the parameters of ordinary differential equations. Classical developments of Hurwitz, Routh, Lyapunov, Poincare, Bendixson, and others in this field are carefully systematized and are rigorously set forth. The first part of the book, which develops the theory of stability of linear and nonlinear differential equations in an abstract form, closes with a section on mathematical methods of approximation with particular emphasis on the perturbation procedure, the method of Galerkin, and the method of harmonic balance developed by Krylov and Bogoljubov.

The second part of the book, which constitutes more than half of the volume, treats a number of special examples of stability theory in mechanics. The illustrative examples on stability of motion include a particle in a central force field, the three-body problem, nonlinear vibrations of single-degree-of-freedom systems, the gyroscope, rockets, satellites, wing flutter, and control systems. Finally, there is a long section on elastic stability that emphasizes recent results for ideal systems with conservative and nonconservative external forces. The kinetic stability criterion advanced by Ziegler receives particular attention in this treatment.

The work calls attention to ambiguity in the meaning of stability that has occasionally caused fruitless arguments. The standard of rigor in the book is high, and the explanations are clear. Although the discussion is related to classical dynamical systems, the general theory is applicable to questions of stability of various physical systems, and conceivably to mathematical models outside of the physical sciences. Anyone who wishes to gain an insight into stability theory will find the work highly profitable, provided that he has a suitable background in the theory of ordinary differential equations.

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