

62[K, P, X].—L. RADANOVIĆ, Editor, *Sensitivity Methods in Control Theory*, Pergamon Press, New York, 1966, xiii + 442 pp., 24 cm. Price \$13.50.

This volume contains 30 papers that were presented at the International Symposium on Sensitivity Analysis, Dubrovnik, Yugoslavia in 1964 under the auspices of the Theory Committee of IFAC and is divided into five sections: I. Basic approaches, II. Sensitivity functions, III. Compensation of parameter variations, IV. Synthesis of insensitive structures, and V. Sensitivity and optimality. Among the basic approaches proposed are stability theory (I. Gumowski and Ya. Z. Tsyphin), invariant imbedding (R. Bellman, R. Kalaba, R. Sridhar), optimality and game theory (P. Dorato, R. F. Drenick), sensitivity operators for linear problems (W. R. Perkins, J. B. Cruz, Jr.), and computer methods and simulation (R. Tomović). Section II is concerned with quantitative measures of sensitivity and their use in the design of systems. Here one sees special methods for special problems. One paper (J. Vidal, W. J. Karplus, and G. Kaludjian) discusses the correction of quantization errors in hybrid computer systems. The systems in Section III are either "self-adjusting" (also called "adaptive") or "insensitive" to parameter variations and various design schemes are proposed. One of these schemes is the use of what the Russians call "the theory of invariance." "Invariance" equals complete insensitivity to a variation of certain parameters. Section IV deals exclusively with the design of insensitive systems. The sensitivity of optimal control systems is discussed in Section V.

As admitted by the editor in the Preface and substantiated by the papers, there is "no unified opinion" as to the meaning of "sensitivity" even though, like the word "stability," everyone has a feeling for what it means. The view of Bellman is that sensitivity is a concept which cannot be defined except relative to a system and what is expected of it. And this suggests mentioning that an important problem is not when is optimality insensitive (Section V) but when does optimality imply insensitivity in this pragmatic sense.

The Proceedings may disappoint someone looking for applicable results but it should be remembered that sensitivity theory is neither well defined nor well developed. The volume contributes to an understanding of the state of development of the theory, its objectives, and proposed methods of attack.

J. P. LASALLE

Brown University
Providence, R. I.

63[K, X].—J. KEILSON, *Green's Function Methods in Probability Theory*, Hafner Publishing Co., New York, 1965, viii + 220 pp., 22 cm. Price \$6.50.

The central subject of the book is the theory of one-dimensional spatially and temporally homogeneous Markov processes, both unrestricted and in the presence of absorbing barriers. The theory is comparable to that in J. H. B. Kemperman's *The Passage Problem for a Stationary Markov Chain*, University of Chicago Press, Chicago, Ill., 1961. Just as Kemperman, the author relies heavily on the analysis of characteristic and moment generating functions in the complex domain. This leads to unified complex variable proofs of central limit theorems, renewal theorems, and other asymptotic results required in the applications to queues, dams, risk, and