B70-1 Truth Functions and the Problem of Their Realization by Two-Terminal Graphs—A. Ádám Akadémiai Kiadó (Budapest, 1968).

This book consists of two parts, the first being a survey of the mathematical theory of Boolean functions. Chapter 1 introduces basic definitions, various normal forms, prime implicants, and symmetric functions. In an appendix to Chapter 1, an unpublished combinatorial and nontrivial theorem of Bakos is given. (This theorem yields a uniform construction of Gray codes as a consequence.) Chapter 2 gives the standard theory of minimality. Applications to special cases such as monotonic or symmetric functions are given. Chapter 3 discusses interrelationships between conjunctive and disjunctive normal forms. Chapter 4 deals with functional completeness and the Post-Yablonsky theorem is proven. Some applications to finite automata are given. Chapter 5 is concerned with the decomposition of truth functions. Chapter 6, on numerical problems, is particularly good. Groups are used to classify truth functions. A form of Pólya's theorem is given and the work of Pólya, Slepian, and the reviewer is presented. A number of special cases are worked out, including some of the results of Povarov. Chapter 7, on linearly separable functions, gives a number of characterizations.

In summary, Part I gives a rather complete survey of the mathematical properties of truth functions.

Part II relates these mathematical properties to the graphs or networks which realize Boolean functions. Chapter 8 is concerned with two-terminal graphs. Particular attention is given to series-parallel graphs, and both Trakhtenbrot's and Ádám's theorems are proven. Chapter 9 is devoted to several kinds of realizations, particularly repetition-free realizations in which the assignment of variables to edges is one-to-one. Various problems concerning these realizations are stated and proven. Chapter 10 is devoted to optimal realizations. Unfortunately, little is said about this interesting topic and the book closes with some open problems.

The book is a fine vehicle for an engineer, mathematician, or computer scientist who wants a concise and accurate survey of switching theory. The book could even be used as a graduate text, although it was not written for this purpose and does not contain problems. The style is excellent and the arguments are clear. The nomenclature generally follows western usage. It is a valuable addition to the literature as it makes available a number of results which had not been published before in English.

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