

Read Online An Algebraic Approach To Association Schemes Lecture Notes In Mathematics Free Download Pdf

Association Schemes An Algebraic Approach to Association Schemes Linear Associative Algebras Corresponding to Association Schemes of Partially Balanced Designs Algebraic Combinatorics I Applications of the Askey-Wilson Polynomials to Association Schemes Theory of Association Schemes Association Schemes of Matrices Algebraic Combinatorics Codes and Association Schemes Q-polynomial Structures for Association Schemes and Distance-regular Graphs Bipartite P- and Q-polynomial Association Schemes Combinatorial and Spectral Properties of Graphs and Association Schemes Methods of Discrete Mathematics Some Implications on Amorphic Association Schemes An Algebraic Approach to the Association Schemes of Coding Theory Association Schemes On a Characterization of the Triangular Association Scheme Association Schemes Association Schemes in certain lattices Graphs and Association Schemes, Algebra and Geometry Classification of Small Class Association Schemes Coming from Certain Combinatorial Objects Special Issue--association Schemes Association Schemes and Partial Designs Subschemes of Group Association Schemes A Nonexistence Theory for Association Schemes and Symmetric Graphs Three-class Association Schemes Non-symmetric 3-class Association Schemes A Recognition Theorem for Association Schemes of Finite Valency Distribution Invariants of Association Schemes Combinatorics The Cyclotomic Eigenvalue and Character Value Problems for Association Schemes Theory of Association

Schemes Construction of Association Schemes from Finite Groups
Association Schemes Representation Theory of Non-Commutative
Association Schemes of Order 6 Non-symmetric 3-class Association
Schemes Maximal $(0,1,2,\dots,T)$ -cliques of Some Association Schemes
Semidefinite Programs and Association Schemes Extensibility of
Association Schemes and GRH-based Deterministic Polynomial
Factoring On Association Schemes of Order 4

The main topics of this dissertation are related to spectral graph theory, a subtopic of algebraic combinatorics. Algebraic combinatorics is the area of mathematics that implements techniques from linear and abstract algebra to solve problems in combinatorics as well as techniques from combinatorics to study algebraic structures. Spectral graph theory focuses on the study of the eigenvalues associated with various matrices for a graph and how the eigenvalues relate to structural properties of the graph. Properties such as connectedness, diameter, independence number, chromatic number and regularity, among others, are all related to the spectrum of a graph. In this dissertation we will study the spectra of various graphs and incorporate well known techniques in spectral graph theory to gain a better understanding of the structure of these graphs. We focus on three topics (Chapters 2, 3 and 4). The variation of these topics reinforces how diverse and useful spectral techniques in graph theory can be. In Chapter 1 we cover notation and basic definitions used throughout this dissertation. We also introduce some well known and powerful results relating the structural properties of a graph to its spectrum. This includes a discussion of the properties of graphs that can be established from the spectrum as well as which graphs are determined by their spectrum. Finally, we give definitions and basic results for association schemes and distance-regular graphs

since the results of this dissertation are related to these structures. In Chapter 2 we study the smallest eigenvalues for distance- j graphs in both the Hamming and Johnson association schemes. Our results for distance- j Hamming graphs settle a conjecture proposed by Van Dam and Sotirov in [29]. In fact, we reach a stronger conclusion than the one proposed by Van Dam and Sotirov. Our results for x distance- j Johnson graphs settle a conjecture proposed by Karloff in [46]. Again, we are able to obtain a stronger conclusion than what is presented in Karloff's conjecture. In Chapter 3 we use the technique of Godsil-McKay switching to construct cospectral mates for graphs formed by taking the union of relations in the Johnson association scheme. Our results offer insight into which graphs in this scheme are not determined by their spectrum. Our work also unifies the switching sets previously found for Johnson graphs in [26] and Kneser graphs in [43]. We also present some open problems related to our work, including a switching set that we would like to see generalized in order to obtain a new infinite family of graphs in the Johnson scheme that are not determined by their spectrum. In Chapter 4 we examine connectivity properties of distance-regular graphs and graphs related to association schemes. In particular, we prove a result on the minimum number of edges that need to be deleted from a distance-regular graph in order to disconnect it into non-singleton components. We also prove a result on the edge-connectivity of distance- j twisted Grassmann graphs which supports a conjecture proposed by Godsil in [35]. Finally, we end the chapter by presenting open problems dealing with the connectivity of color classes in association schemes. We explore two- or three-class association schemes. We study aspects of the structure of the relation graphs in association schemes which are not easily revealed by their parameters and spectra. The purpose is to develop some

combinatorial methods to characterize the graphs and classify the association schemes, and also to delve deeply into several specific classification problems. We work with several combinatorial objects, including strongly regular graphs, distance-regular graphs, the desarguesian complete set of mutually orthogonal Latin squares, orthogonal arrays, and symmetric Bush-type Hadamard matrices, all of which give rise to many small-class association schemes. We work within the framework of the theory of association schemes. Our focus is placed on the search for all isomorphism classes of association schemes and characterization of small-class association schemes of specific order. In particular, we examine two-class association schemes (strongly regular graphs) of order 64 and their three-class fission schemes. After we collect 'feasible' parameter sets for the putative association schemes, we make an attempt to check the realization (existence) of the parameter sets and describe the structure of the schemes chiefly by investigating the structure of their relation graphs. In the course of this thesis, we find a new way to construct orthogonal arrays and investigate their implications for strongly regular graphs, symmetric Bush-type Hadamard matrices, and three-class association schemes. We obtain several results regarding the characterization and classification of two- or three-class association schemes of order 64. The primary object of the lecture notes is to develop a treatment of association schemes analogous to that which has been so successful in the theory of finite groups. The main chapters are decomposition theory, representation theory, and the theory of generators. Tits buildings come into play when the theory of generators is developed. Here, the buildings play the role which, in group theory, is played by the Coxeter groups. - The text is intended for students as well as for researchers in algebra, in particular in algebraic combinatorics. This volume presents papers related to the

DIMACS workshop, "Codes and Association Schemes". The articles are devoted to the following topics: applications of association schemes and of the polynomial method to properties of codes, structural results for codes, structural results for association schemes, and properties of orthogonal polynomials and their applications in combinatorics. Papers on coding theory are related to classical topics, such as perfect codes, bounds on codes, codes and combinatorial arrays, weight enumerators, and spherical designs. Papers on orthogonal polynomials provide new results on zeros and asymptotic properties of standard families of polynomials encountered in coding theory. The theme of association schemes is represented by new classification results and new classes of schemes related to posets. This volume collects up-to-date applications of the theory of association schemes to coding and presents new properties of both polynomial and general association schemes. It offers a solid representation of results in problems in areas of current interest. Association schemes are of interest to both mathematicians and statisticians and this book was written with both audiences in mind. For statisticians, it shows how to construct designs for experiments in blocks, how to compare such designs, and how to analyse data from them. The reader is only assumed to know very basic abstract algebra. For pure mathematicians, it tells why association schemes are important and develops the theory to the level of advanced research. This book arose from a course successfully taught by the author and as such the material is thoroughly class-tested. There are a great number of examples and exercises that will increase the book's appeal to both graduate students and their instructors. It is ideal for those coming either from pure mathematics or statistics backgrounds who wish to develop their understanding of association schemes. The central focus of this dissertation is an answer to the cyclotomic eigenvalue question

(CEQ) for commutative association schemes. This question, which was posed by Simon Norton at Oberwolfach in 1980, asks whether all entries of the character table of a commutative association scheme lie in a cyclotomic extension of the rational numbers. In this thesis, we consider the cyclotomic eigenvalue question for objects that generalize the notion of association schemes. The objects in question are standard integral table algebras with integral multiplicities (SITAwIMs). Our main results show the eigenvalues of SITAwIMs of rank 4 and nonsymmetric ones of rank 5 are cyclotomic. This implies that the CEQ is affirmative for association schemes of rank 4 and nonsymmetric association schemes of rank 5. Moreover, for rank 5 symmetric SITAwIMs we give several examples that have noncyclotomic eigenvalues, and show the parameters for many of these examples satisfy all known parameter requirements for association schemes. Next, we provide an algorithm for computing fusions of a based algebra $(A;B)$. We apply this algorithm to three problems: (1) computing fusion lattices for association schemes, of order up to 30; (2) realizing association schemes with transitive automorphism groups; (3) producing small examples of non-Schurian association schemes with noncyclotomic eigenvalues. We give an example of a group of order 96 for which two of its Schurian association scheme quotients have non-Schurian fusions with noncyclotomic eigenvalues. The latter is of interest to the open question asking whether association schemes with transitive automorphism groups can have noncyclotomic character values.

Combinatorics has come of age. It had its beginnings in a number of puzzles which have still not lost their charm. Among these are EULER'S problem of the 36 officers and the KONIGSBERG bridge problem, BACHET's problem of the weights, and the Reverend T.P. KIRKMAN'S problem of the schoolgirls. Many of the topics treated

in ROUSE BALL'S Recreational Mathematics belong to combinatorial theory. All of this has now changed. The solution of the puzzles has led to a large and sophisticated theory with many complex ramifications. And it seems probable that the four color problem will only be solved in terms of as yet undiscovered deep results in graph theory. Combinatorics and the theory of numbers have much in common. In both theories there are many problems which are easy to state in terms understandable by the layman, but whose solution depends on complicated and abstruse methods. And there are now interconnections between these theories in terms of which each enriches the other. Combinatorics includes a diversity of topics which do however have interrelations in superficially unexpected ways. The instructional lectures included in these proceedings have been divided into six major areas: 1. Theory of designs; 2. Graph theory; 3. Combinatorial group theory; 4. Finite geometry; 5. Foundations, partitions and combinatorial geometry; 6. Coding theory. They are designed to give an overview of the classical foundations of the subjects treated and also some indication of the present frontiers of research. This book is a concept-oriented treatment of the structure theory of association schemes. The generalization of Sylow's group theoretic theorems to scheme theory arises as a consequence of arithmetical considerations about quotient schemes. The theory of Coxeter schemes (equivalent to the theory of buildings) emerges naturally and yields a purely algebraic proof of Tits' main theorem on buildings of spherical type. Based on the author's graduate course on association schemes and the optimal design of scientific experiments, this book is accessible to both pure mathematicians and statisticians alike. It will appeal to researchers as an accessible reference work from which to learn about the statistical/combinatorial aspect of their work. This book is a

concept-oriented treatment of the structure theory of association schemes. The generalization of Sylow ' s group theoretic theorems to scheme theory arises as a consequence of arithmetical considerations about quotient schemes. The theory of Coxeter schemes (equivalent to the theory of buildings) emerges naturally and yields a purely algebraic proof of Tits ' main theorem on buildings of spherical type. Algebraic combinatorics is the study of combinatorial objects as an extension of the study of finite permutation groups, or, in other words, group theory without groups. In the spirit of Delsarte's theory, this book studies combinatorial objects such as graphs, codes, designs, etc. in the general framework of association schemes, providing a comprehensive overview of the theory as well as pointing out to extensions.

- [Association Schemes](#)
- [An Algebraic Approach To Association Schemes](#)
- [Linear Associative Algebras Corresponding To Association Schemes Of Partially Balanced Designs](#)
- [Algebraic Combinatorics I](#)
- [Applications Of The Askey Wilson Polynomials To Association Schemes](#)
- [Theory Of Association Schemes](#)
- [Association Schemes Of Matrices](#)
- [Algebraic Combinatorics](#)
- [Codes And Association Schemes](#)

- [Q polynomial Structures For Association Schemes And Distance regular Graphs](#)
- [Bipartite P And Q polynomial Association Schemes](#)
- [Combinatorial And Spectral Properties Of Graphs And Association Schemes](#)
- [Methods Of Discrete Mathematics](#)
- [Some Implications On Amorphic Association Schemes](#)
- [An Algebraic Approach To The Association Schemes Of Coding Theory](#)
- [Association Schemes](#)
- [On A Characterization Of The Triangular Association Scheme](#)
- [Association Schemes](#)
- [Association Schemes In Certain Lattices](#)
- [Graphs And Association Schemes Algebra And Geometry](#)
- [Classification Of Small Class Association Schemes Coming From Certain Combinatorial Objects](#)
- [Special Issue association Schemes](#)
- [Association Schemes And Partial Designs](#)
- [Subschemes Of Group Association Schemes](#)
- [A Nonexistence Theory For Association Schemes And Symmetric Graphs](#)
- [Three class Association Schemes](#)
- [Non symmetric 3 class Association Schemes](#)
- [A Recognition Theorem For Association Schemes Of Finite Valency](#)
- [Distribution Invariants Of Association Schemes](#)
- [Combinatorics](#)
- [The Cyclotomic Eigenvalue And Character Value Problems For Association Schemes](#)

- [Theory Of Association Schemes](#)
- [Construction Of Association Schemes From Finite Groups](#)
- [Association Schemes](#)
- [Representation Theory Of Non Commutative Association Schemes Of Order 6](#)
- [Non symmetric 3 class Association Schemes](#)
- [Maximal 012T cliques Of Some Association Schemes](#)
- [Semidefinite Programs And Association Schemes](#)
- [Extensibility Of Association Schemes And GRH based Deterministic Polynomial Factoring](#)
- [On Association Schemes Of Order 4](#)