Algebra and Number Theory Seminar

Title: Completion problems for matrices with entries in arbitrary positions

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Location: Mathematical Sciences Seminar Room

Abstract: Let L be a given multiset of n ¿ 1 elements in an integral domain R and let P be a matrix of order n with p prescribed entries that belong to R. We are interested in the following type of completion problems: under what assumptions of R, p and the position of the prescribed entries (with as few restrictions as possible) is it possible to complete P over R to obtain a matrix A with spectrum L? There is a classical result by Herskowitz [1] that says that for R a

field, p = 2n - 3, and the prescribed entries in arbitrary positions, except for two exceptions, it is possible to complete P. For this classical result we will describe and algorithm that constructs the desired completion. Then, we will extend the result to integral domains and also describe an algorithm that

finds such a completion [2]. We will say what properties do these particular completions have. We will also explain why 2n - 3 is a natural bound and if it is possible

to go beyond 2n - 3, and fi

nally what other approaches to these type of problems we can

find in the literature ([3] and [4]).

References [1] D. Hershkowitz. Existence of matrices with prescribed eigenvalues and entries. Linear and Multilinear Algebra, 14(4):315–342, 1983. [2] Alberto Borobia, Roberto Canogar, and Helena Smigoc. A matrix completion problem over integral domains: the case with 2n - 3 prescribed entries. Linear Algebra Appl., 433:606–617, 2010. [3] Moody T. Chu, Fasma Diele, and Ivonne Sgura. Gradient flow methods for matrix completion with prescribed eigenvalues. Linear Algebra Appl., 379:85–112, 2004. Tenth Conference of the International Linear Algebra Society. [4] Kh.D. Ikramov and V.N. Chugunov. Inverse matrix eigenvalue problems. J. Math. Sci. (New York), 98(1):51–136, 2000.