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UNIVERSALLY OPTIMAL MATRICES AND FIELD INDEPENDENCE OF THE MINIMUM RANK OF A GRAPH[*]

LUZ M. DEALBA[†], JASON GROUT[‡], LESLIE HOGBEN[§], RANA MIKKELSON[‡], AND KAELA RASMUSSEN[‡]

Abstract. The minimum rank of a simple graph G over a field F is the smallest possible rank among all symmetric matrices over F whose (i, j)th entry (for $i \neq j$) is nonzero whenever $\{i, j\}$ is an edge in G and is zero otherwise. A universally optimal matrix is defined to be an integer matrix A such that every off-diagonal entry of A is 0, 1, or -1, and for all fields F, the rank of A is the minimum rank over F of its graph. Universally optimal matrices are used to establish field independence of minimum rank for numerous graphs. Examples are also provided verifying lack of field independence for other graphs.

Key words. Minimum rank, Universally optimal matrix, Field independent, Symmetric matrix, Rank, Graph, Matrix.

AMS subject classifications. 05C50, 15A03.