

Some recent results in algebraic graph theory

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Abstract

The rank of a graph G is defined to be the rank (over \mathcal{R}) of its adjacency matrix. In the first part of the talk, we consider the following problem: What is the structure of a connected graph with rank 4? In this talk, we resolve this question by completely characterizing graphs G whose adjacency matrix has rank 4. Given a graph G on n vertices and a field F , the maximum nullity of G over F , denoted by $M^F(G)$, is the largest possible nullity over all $n \times n$ symmetric matrices over F whose (i, j) th entry (for $i \neq j$) is nonzero whenever ij is an edge in G and is zero otherwise. The maximum nullity problem of a graph G is to determine $M^F(G)$. In 2008, the AIM Minimum Rank–Special Graphs Work Group introduced a new graph parameter $Z(G)$, the zero forcing number, to bound $M^F(G)$ from above. The authors posted the following question: What is the class of graphs G for which $Z(G) = M^F(G)$ for some field F ? In the second part of this talk, selected recent results on the question will be presented. If time permits, I'll also sketch our work done on the rank of a cograph. This talk is based on joint papers with Prof. Gerard J. Chang (National Taiwan University) and Dr. Liang-Hao Huang (National Central University).