An Upper Bound on the Order of a Family of Edge-Regular Graphs

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Abstract

We build on previous results concerning regular simple graphs in which there exists a $\lambda > 0$ such that any two adjacent vertices have exactly $\lambda$ common neighbors, and the union of their neighborhoods includes all but exactly $\mu$ vertices. It has been determined that the maximum number of vertices on such a graph given such a $\lambda$ and $\mu$ is $3\lambda + 3\mu$, and that, the graphs containing this number of vertices are, for the most part, unique. In this talk, we examine graphs having the requirements above with order $n < 3\lambda + 3\mu$; in particular, we characterize such graphs of order $3\lambda + 3\mu - 2$, where $\mu$ is even, and whose common-neighbor sets of adjacent vertex-pairs induce a perfect matching. Time permitting, we will present results where $\mu$ is odd.