UPPER K-TUPLE DOMINATION

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For a positive integer k, a k-tuple dominating set of a graph G is a subset S of $V(G)$ such that $|N[v] \cap S| \geq k$ for every vertex v, where $N[v] = \{v\} \cup \{u \in V(G) \mid uv \in E(G)\}$. A k-tuple dominating set of G is minimal (by inclusion) if no proper subset is a k-tuple dominating set. The upper k-tuple domination number of G, denoted by $\Gamma_{\times k}(G)$, is the maximum cardinality of a minimal k-tuple dominating set of G. This parameter can be seen as the worst result a greedy algorithm could return. In this paper we present an upper bound on $\Gamma_{\times k}(G)$ for r-regular graphs (with $r \geq k$), and characterize extremal graphs achieving the upper bound. We also establish a sharp upper bound on $\Gamma_{\times k}(G)$ for $K_{1,r}$-free regular graphs. On the algorithmic aspect, we show that the decision problem corresponding to the upper k-tuple domination number is NP-complete even restricted to bipartite graphs and to chordal graphs.

Keywords: Upper k-tuple domination, regular graphs, NP completeness.

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