

Generalized Power Domination in Regular Graphs

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Abstract

In this paper, we continue the study of power domination in graphs (see SIAM J. Discrete Math. 15 (2002), 519–529; SIAM J. Discrete Math. 22 (2008), 554–567; SIAM J. Discrete Math. 23 (2009), 1382–1399). Power domination in graphs was birthed from the problem of monitoring an electric power system by placing as few measurement devices in the system as possible. A set of vertices is defined to be a power dominating set of a graph if every vertex and every edge in the system is monitored by the set following a set of rules (according to Kirschoff laws) for power system monitoring. The minimum cardinality of a power dominating set of a graph is its power domination number. We show that the power domination of a connected cubic graph on n vertices different from $K_{3,3}$ is at most $n/4$ and this bound is tight. More generally, we show that for $k \geq 1$ the k -power domination number of a connected $(k+2)$ -regular graph on n vertices different from $K_{k+2,k+2}$ is at most $n/(k+3)$, where the 1-power domination number is the ordinary power domination number. We show that these bounds are tight.

Keywords: Power domination; electrical network monitoring; domination; regular graphs.

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