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A Problem on Domatic partition

Posed by

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A domatic partition of a graph G is a partition of $V(G)$ into classes that are pairwise disjoint dominating sets. The domatic number of G is maximum cardinality of a domatic partition of G and it is denoted by $d(G)$.

Let G be a graph with domatic number $d(G)$. A partition $\Pi = \{D_1, D_2, \ldots, D_d\}$ is called a minimal dominating d-partition if Π contains maximum number of minimal dominating sets, where the maximum is taken over all d-partitions of G. The minimal dominating d-partition number $\Lambda(G)$ is the number of minimal dominating sets in a minimum dominating d-partition of G.

Let $G = (V, E)$ be a graph with domatic number $d(G) \geq 2$. Let $\{D_1, D_2, \ldots, D_d\}$ be a d-partition of G. Since each D_i contains a minimal dominating set, it follows that by transferring elements from $D_1, D_2, \ldots, D_{d-1}$ to D_d, the sets $D_1, D_2, \ldots, D_{d-1}$ can be made minimal dominating sets. Hence it follows that $\Lambda(G) = d - 1$ or d.

A graph G is said to be class 1 or class 2 according as $\Lambda = d - 1$ or $\Lambda = d$.

Problem

Characterize graphs of class 1 or class 2.