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Minimal 2-point set dominating sets of a graph

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Abstract

A set $D \subseteq V(G)$ is a 2-*point set dominating set* (2-psd set) of a graph G if for any subset $S \subseteq V - D$, there exists a non-empty subset $T \subseteq D$ containing at most two vertices such that the induced subgraph $\langle S \cup T \rangle$ is connected. In this paper we characterize minimal 2-psd sets for a general graph. Based on the structure we examine 2-psd sets in a separable graph and discuss the criterion for a 2-psd set to be minimal.

Keywords: 2-Point set domination; Point set domination; Domination

1. Introduction

By a graph G we mean a finite, undirected, connected and non-trivial graph with neither loops nor multiple edges. The order $|V(G)|$ and the size $|E(G)|$ of G are denoted by n and m respectively. For graph theoretic terminology we refer to Harary [1] and West [2]. The *open neighborhood* $N(v)$ of any vertex v in G is $\{x : xv \in E(G)\}$ and *closed neighborhood* $N[v]$ of v in G is $N(v) \cup \{v\}$. For a set $S \subseteq V(G)$ the open (closed) neighborhood of S in G is $N(S)$ ($N[S]$) and is defined as $N(S) = \cup_{v \in S} N(v)$ ($N[S] = \cup_{v \in S} N[v]$).

Definition 1.1 (*[3]*)**.** A set $D \subseteq V(G)$ is a **dominating set of a graph** G if for every vertex v in $V - D$, there exists a vertex $u \in D$ such that v is adjacent to u. The domination number of G is the minimum cardinality of a dominating set of G.

Definition 1.2 (*[4]*)**.** A set $D \subseteq V(G)$ is a **set dominating set of a graph** G if for every set $S \subseteq V - D$, there exists a non-empty set $T \subseteq D$ such that the induced subgraph $\langle S \cup T \rangle$ is connected. The set domination number of G is the minimum cardinality of a set dominating set of G.

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