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A Study on Set-Valuations of Signed Graphs

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Abstract: Let X be a non-empty ground set and $\mathcal{P}(X)$ be its power set. A set-labeling (or a set-valuation) of a graph G is an injective set-valued function $f : V(G) \to \mathcal{P}(X)$ such that the induced function $f^{\oplus} : E(G) \to \mathcal{P}(X)$ is defined by $f^{\oplus}(uv) = f(u) \oplus f(v)$, where $f(u) \oplus f(v)$ is the symmetric difference of the sets $f(u)$ and $f(v)$. A graph which admits a set-labeling is known to be a set-labeled graph. A set-labeling f of a graph G is said to be a set-indexer of G if the associated function $f^{\oplus}$ is also injective. In this paper, we define the notion of set-valuations of signed graphs and discuss certain properties of signed graphs which admits certain types of set-valuations.

Key Words: Signed graphs, balanced signed graphs, clustering of signed graphs, set-labeled signed graphs.

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§1. Introduction

For all terms and definitions, not defined specifically in this paper, we refer to [4, 8, 13] and and for the topics in signed graphs we refer to [14, 15]. Unless mentioned otherwise, all graphs considered here are simple, finite, undirected and have no isolated vertices.

1.1 An Overview of Set-Valued Graphs

Let X be a non-empty set and $\mathcal{P}(X)$ be its power set. A *set-labeling* (or a *set-valuation*) of a graph G is an injective function $f : V(G) \to \mathcal{P}(X)$ such that the induced function $f^{\oplus} : E(G) \to \mathcal{P}(X)$ is defined by $f^{\oplus}(uv) = f(u) \oplus f(v)\ \forall\ uv \in E(G)$, where $\oplus$ is the symmetric difference of two sets. A graph G which admits a set-labeling is called an *set-labeled graph* (or a set-valued graph)(see [1]).

A *set-indexer* of a graph G is an injective function $f : V(G) \to \mathcal{P}(X)$ such that the induced function $f^{\oplus} : E(G) \to \mathcal{P}(X)$ is also injective. A graph G which admits a set-indexer is called a *set-indexed graph* (see [1]).

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