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Constructions of 1-Uniform dcsl graphs using Well-graded families of sets

Nageswara Rao K , Shaini P [1,2]

Department of Mathematics
Central University of Kerala
Kasaragod, India

Germina K A [3]

Mathematics Research Center, Mary Matha Arts & Science College
Kannur University
Mananthavady, India

Abstract

A 1-uniform dcsl of a graph G is an injective set assignment function $f : V(G) \to 2^X$, X be a non-empty set, such that the corresponding induced function $f^{\oplus} : V(G) \times V(G) \to 2^X \setminus \{\phi\}$ given by $f^{\oplus}(uv) = f(u) \oplus f(v)$ satisfies $|f^{\oplus}(u, v)| = 1.d(u, v)$ for all distinct $u, v \in V(G)$, where $d(u, v)$ is the length of a shortest path between u and v, and $f(u) \oplus f(v)$ denotes the symmetric difference of the two sets. Let $\mathcal{F}$ be a family of subsets of a set X. A *tight path* between two distinct sets P and Q (or from P to Q) in $\mathcal{F}$ is a sequence $P_0 = P, P_1, P_2 \ldots P_n = Q$ in $\mathcal{F}$ such that $d(P, Q) =\mid P \triangle Q \mid = n$ and $d(P_i, P_{i+1}) = 1$ for $0 \leq i \leq n-1$. The family $\mathcal{F}$ is *well-graded* (or *wg-family*), if there is a *tight path* between any two of its distinct sets. Any family $\mathcal{F}$ of subsets of X defines a graph $G_{\mathcal{F}} = (\mathcal{F}, E_{\mathcal{F}})$, where $E_{\mathcal{F}} = \{\{P, Q\} \subseteq \mathcal{F} :\mid P \triangle Q \mid = 1\}$, and we call $G_{\mathcal{F}}$, *an $\mathcal{F}$-induced graph.* The purpose of this paper is to examine the existence of 1-uniform dcsl of an induced graph $G_{\mathcal{F}_1 \cup \mathcal{F}_2 \cup \ldots \mathcal{F}_n}$ formed from the finite union of well-graded families $\mathcal{F}_1, \mathcal{F}_2, \ldots,$ and $\mathcal{F}_n$ by introducing amalgamation techniques in

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