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S_5-DECOMPOSITION OF KNESER GRAPHS

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Abstract: Let $A = \{1, 2, 3, ..., n\}$ and $\mathcal{P}_k(A)$ denotes the set of all k-element subsets of A. The Kneser graph $KG_{n,2}$ has the vertex set $V(KG_{n,2}) = \mathcal{P}_2(A)$ and edge set $E(KG_{n,2}) = \{XY | X, Y \in \mathcal{P}_2(A) \text{ and } X \cap Y = \emptyset\}$. A star with k edges is denoted by S_k. In this paper, we show that the graph $KG_{n,2}$ can be decomposed into S_5 if and only if $n \geq 7$ and $n \equiv 0, 1, 2, 3 (mod\ 5)$.

Keywords and Phrases: Decomposition, Tensor Product, Complete Bipartite Graph, Kneser Graph, Crown Graph, Star.

2020 Mathematics Subject Classification: 05C70, 05C76.

1. Introduction

All the graphs considered in this paper are finite. For a graph G, $G(\lambda)$ is the graph obtained from G by replacing each of its edges by λ parallel edges. If a graph G has no edges, then it is called a *null graph*. Let $K_{m,n}$ denote a *complete bipartite graph* with m and n vertices in the parts. A *star* with k edges is denoted by S_k and $S_k \cong K_{1,k}$. A *path* with k edges is denoted by P_k and a *cycle* with k edges is denoted by C_k. A *Hamilton cycle* of G is a cycle that contains every vertex of G. A graph G is *Hamiltonian* if it contains a Hamilton cycle. The degree of a vertex x of G, denoted by $deg_G x$ is the number of edges incident with x in G. Let k be a positive integer. A graph G is said to be *k-regular*, if each vertex in G is of degree k. If $H_1, H_2, ..., H_l$ are edge disjoint subgraphs of a graph G such that