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# E-SUPER VERTEX MAGIC LABELING FOR CATERPILLAR GRAPH

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Graph labeling has been an exciting area of research in graph theory. Most graph labeling origins can be traced back to the mid-1960s. Over the last 60 years, more than 100 graph-labelling techniques have been studied. E-super vertex magic labeling is a type of modern concept when compared with other popular labeling patterns such as graceful labeling, harmonious labeling, lucky labeling, anti-magic labeling, etc. It is one of the most challenging and interesting labeling techniques with various applications. For a finite simple graph $G$, the set of vertices and edges are denoted by $V(G)$ and $E(G)$, respectively. If $G$ is a simple undirected graph with $p$ vertices and $q$ edges, then vertex magic total labeling is a bijective map $f$ from $V(G) \cup E(G)$ onto the set $\{ 1, 2, \ldots, p+q, \}$ with the property that, for every vertex $u$ in $V(G)$, $f(u) + \sum_{V \in N(u)} f(uv) = k$, where $k$ is a constant and set $N(u)$ denotes the vertices adjacent to the vertex $u$. The labeling is called E-super vertex magic if $f(E(G)) = \{1, 2, \ldots, q\}$. A graph $G$ is called E-super vertex magic if it admits an E-super vertex magic labeling. Intending to answer the open problem, every tree is E-super vertex magic to some extent; we focus on the E-super vertex magic labeling for the caterpillar graph. In this study, we can prove that E-super vertex magic labeling does not exist for the star graphs $S_n$ with $n \geq 4$. Consequently, we proved that the caterpillar graph, which has a star graph as a subgraph, is not an E-super vertex graph for order; $n \geq 7$.

**Keywords**: Caterpillar graph, E-super vertex magic labeling, Star graph