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b-Chromatic Sum of Mycielskian of Paths

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Abstract

A b-coloring of a graph G is a proper coloring of the vertices of G such that there exist a vertex in each color class joined to at least one vertex in each other color classes. The b-chromatic number of a graph G, denoted by $\varphi(G)$, is the largest integer k such that G has a b-coloring with k colors. The b-chromatic sum of a graph $G(V, E)$, denoted by $\varphi'(G)$ is defined as the minimum of sum of colors $c(v)$ of v for all $v \in V$ in a b-coloring of G using $\varphi(G)$ colors, where the colors are taken as the positive integer. In this paper, the b-chromatic sum of Mycielskian of a path is discussed.

Keywords: b-chromatic number, b-coloring, b-dominating set, b-chromatic sum, Mycielskian, path.

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1 Introduction

The concept of b-chromatic number of a graph G is introduced by Robert W Irving and David F Manlove in [5]. They have defined the b-chromatic number $\varphi(G)$ of a graph G as the largest positive integer k such that G admits a proper k-coloring in which every color class has a representative vertex which is adjacent to at least one vertex in each of the other color classes and this representative vertex is known as the b-dominating vertex. It is clear that for a graph G to have a b-coloring of k colors, G must contain at least k vertices, each of degree at least $k-1$. In 2015, Lisna et al. [9] introduced a new concept, the b-chromatic sum of a graph $G(V,E)$, denoted by $\varphi'(G)$ and is defined as the minimum of sum of colors $c(v)$ of v for all $v \in V$ in a b-coloring of G using $\varphi(G)$ colors. Here the colors are taken as the positive integers. They also obtained the b-chromatic sum of paths, cycles, wheel graph, complete graph, star graph, double star graph, complete bipartite graph, corona of paths and corona of cycles. Motivated by the studies on b-chromatic sum of graphs, in [7] johan Kok et al. introduced certain new parameters such as χ-chromatic sum, χ^+-chromatic sum, b^+-chromatic sum, Π-chromatic sum and π^+-chromatic sum of graphs. In 2015, Lisna et al. [8] obtained the b-chromatic numbers of the coronas of cycles, star graphs and wheel graphs with different numbers of vertices, respectively. Also the bounds for the b-chromatic number of corona of any two graphs is discussed. In 2014, Lisna et al. discussed the b-chromatic number of Mycielskian of cycles [10]. Bonomo et al. [2] proved that P_4-sparse graphs (and, in particular, cographs) are b-continuous and b-monotonic. Besides, they described a dynamic programming algorithm to compute the b-chromatic number in polynomial time within these graph classes. El Sahili et al. [1] studied the b-chromatic number of a d-regular graph of girth 5. Also Sergio Cabello et al. [14] discussed the b-chromatic number of regular graphs according to their girth and diameter. R Javadi et al. [6] studied the b-coloring of Kneser graphs $K(n;k)$ and determined the b-chromatic number of $K(n;k)$ for some values of n and k. Moreover, they proved that $K(n;2)$ is b-continuous for $n \geq 17$. In 2007, [3] Elghazel et al. discussed the applications of b-coloring in clustering. Vernold Vivin J et al. [19] obtained the b-chromatic number of corona of two graphs with same number of vertices. In 2011, [13] Parsonag E et al. discussed the applications of corona of graphs in network design and analysis. In 2013, [15] venkatachalam et al. obtained the b-chromatic number of Windmill graph. In 2014, [16] Venkatachalam et al. discussed the b-chromatic number for the central graph, middle graph, total graph and line graph of double star graph