The b-coloring of corona product of graphs

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A proper vertex coloring c of a graph G is called *b-coloring* if for every color i, there exists a vertex v where $c(v) = i$ such that for every other colors, there exists a vertex which is adjacent to v. The *b-chromatic number* of G, denoted by $\varphi(G)$, is the maximum integer k such that G has a b-coloring with k colors. In this paper, we consider the corona product between two connected graphs. The *corona product* of graphs G and H, denoted by $G \odot H$, is defined as a graph obtained by taking one copy of G and $|V(G)|$ copies H_1, H_2, ..., $H_{|V(G)|}$ of H, then connecting the i-th vertex of G to every vertex of H_i. Let G and H be connected graphs of order n and m, respectively. In 2015, Lisna and Sunitha have been proved that if $n > m$, then $m+1 \leq \varphi(G \odot H) \leq n$, otherwise $n \leq \varphi(G \odot H) \leq m+1$. In this paper, we improve the general bounds of $\varphi(G \odot H)$ for $m < n$ and show that all values of $\varphi(G \odot H)$ in the new bounds are achievable. We also characterize all graphs G and H where the b-chromatic number of $G \odot H$ is satisfying the new upper bound. Furthermore, we determine an exact value of $\varphi(G \odot H)$ for any connected graphs G and H of order n and m, respectively, where $n \leq m$.

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