ON MINIMUM FEEDBACK ARC SETS OF MYCIELSKIANS, CARTESIAN AND LEXICOGRAPHIC PRODUCTS OF DIGRAPHS

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A set S of arcs of a digraph D is a feedback arc set if removing S from D results in an acyclic digraph. In this talk, we investigate the influence of the Cartesian and lexicographic product operations, as well as the Mycielskian operation, on the size of a minimum feedback arc set, denoted by $\tau_1(D)$ for a given digraph D. Let $D_1 \Box D_2$ and $D_1[D_2]$ denote the Cartesian and lexicographic products of digraphs D_1 and D_2, respectively. We give exact formulas for both $\tau_1(D_1 \Box D_2)$ and $\tau_1(D_1[D_2])$ as functions of $\tau_1(D_1)$, $\tau_1(D_2)$, and the orders of D_1 and D_2. We also obtain an upper bound of $3\tau_1(D)$ on $\tau_1(M(D))$, where $M(D)$ is the Mycielskian of D. We identify classes of digraphs D for which the equality $\tau_1(M(D)) = 3\tau_1(D)$ holds, showing that the bound is sharp. Moreover, we present a nontrivial example of a digraph D for which the strict inequality $\tau_1(M(D)) < 3\tau_1(D)$ is satisfied. Let $\nu_1(D)$ denote the maximum number of arc-disjoint directed cycles in D. We finally prove that the class of digraphs satisfying the equality $\tau_1(D) = \nu_1(D)$ is closed under Cartesian and lexicographic products, as well as under the Mycielskian operation.

References

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