CYCLES OF LENGTH 3 AND 4 IN EDGE-COLORED COMPLETE GRAPHS WITH RESTRICTIONS IN THE COLOR TRANSITIONS

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Consider the following edge-coloring of a graph G. Let H be a graph possibly with loops. We say that G is an H-colored graph whenever there exists a function $c : E(G) \longrightarrow V(H)$. A walk $(u_1, \cdots, u_k)$ in an H-colored graph G is an H-walk iff $(c(v_1 v_2), c(v_2 v_3), \cdots, c(v_{k-1} v_k))$ is a walk in H, and a cycle $(v_1, \cdots, v_n, v_1)$ is an H-cycle iff $(c(v_1 v_2), c(v_2 v_3), \cdots, c(v_{n-1} v_n), c(v_n v_1), c(v_1 v_2))$ is a walk in H. Hence, H decides which color transitions are allowed in a cycle in order to be an H-cycle, in particular, when H is a complete graph without loops, every H-cycle is a properly colored cycle. It is worth to mention that the study of the existence of certain H-walks in H-colored graphs, began in [1].

Let G be an H-colored complete graph. In this work, we show conditions implying that each vertex of G is contained in an H-cycle of length 3 (respectively 4).

References

[1] H. Galeana-Sánchez, R. Rojas-Monroy, R. Sánchez-López, J.I. Villareal-Valdés, Some Conditions for the Existence of Euler H-trails, Graphs and Combinatorics. 35 (2019) 1197-1208.

[2] H. Galeana-Sánchez, F. Hernández-Lorenzana, R. Sánchez-López, Cycles of length 3 and 4 in edge-colored complete graphs with restrictions in the color transitions, arXiv:2207.01699 (2022)