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Uniquely embeddable 2-factors

Igor Grzelec
WMS AGH

An *embedding* of a graph G, of order n, (in its complement $\overline{G}$) is a permutation σ on $V(G)$ such that if an edge xy belongs to $E(G)$, then $\sigma(x)\sigma(y)$ does not belong to $E(G)$. In others words, an embedding is an (edge-disjoint) *packing* of two copies of G into a complete graph K_n. We will consider the problem of the uniqueness of such embeddings. Two embeddings σ_1, σ_2 of a graph G are said to be *distinct* if the graphs $G \oplus \sigma_1(G)$ and $G \oplus \sigma_2(G)$ are not isomorphic (for graphs G_1 and G_2 with $V(G_1) = V(G_2)$ and $E(G_1) \cap E(G_2) = \emptyset$ the *edge sum* $G_1 \oplus G_2$ has $V(G) = V(G_1) = V(G_2)$ and $E(G) = E(G_1) \cup E(G_2)$). A graph G is called *uniquely embeddable* if for all embeddings σ of G, all graphs $G \oplus \sigma(G)$ are isomorphic.

Let $C_{n_1} \cup C_{n_2} \cup \ldots \cup C_{n_k}$ be a 2-factor *i.e.* a vertex-disjoint union of cycles. We completely characterize 2-factors *i.e.* we prove which 2-factors are not embeddable, which are uniquely embeddable and which have at least two distinct embeddings.

This is a joint work with Monika Pilśniak and Mariusz Woźniak.