Total weight choosability of trees

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Abstract

A total-weighting of a graph $G = (V, E)$ is a mapping f which assigns to each element $y \in V \cup E$ a real number $f(y)$ as the weight of y. A total-weighting f of G is proper if the colouring ϕ_f of the vertices of G defined as $\phi_f(v) = f(v) + \sum_{e \ni v} f(e)$ is a proper colouring of G, i.e., $\phi_f(v) \neq \phi_f(u)$ for any edge uv. For positive integers k and k', a graph G is called (k, k')-total-weight-choosable if whenever each vertex v is given k permissible weights and each edge e is given k' permissible weights, there is a proper total-weighting f of G which uses only permissible weights on each element $y \in V \cup E$. It is known that every tree is $(2, 2)$-total-weight-choosable and every tree other than K_2 is $(1, 3)$-total-weight-choosable. However, the problem of determining which trees are $(1, 2)$-total-weight-choosable remained open. In this talk, I present the result in a joint paper with Gerard Jennhwa Chang, Guan-Huei Duh and Tsai-Lien Wong, in which we solve this problem and characterizes all $(1, 2)$-total-weight-choosable trees. Based on this characterization, we give an algorithm that determines in linear time whether a given tree is $(1, 2)$-total-weight-choosable.