*IPM Biennial Conference on
Combinatorics and Computing,
May 20-22, 2025, School of Mathematics, IPM, Tehran
40 Years in Designs: Celebrating the Life and Achievement of
Professor Gholamreza B. Khosrovshahi*

Fair Coalitions in Graphs

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Let $G = (V, E)$ be a simple graph. A dominating set of G is a subset $D \subseteq V$ such that every vertex not in D is adjacent to at least one vertex in D. The cardinality of a smallest dominating set of G, denoted by $\gamma(G)$, is the domination number of G. For $k \geq 1$, a k-fair dominating set (kFD-set) in G, is a dominating set S such that $|N(v) \cap D| = k$ for every vertex $v \in V \setminus D$. A fair dominating set in G is a kFD-set for some integer $k \geq 1$. We define a fair coalition in a graph G as a pair of disjoint subsets $A_1, A_2 \subseteq A$ that satisfy the following conditions: (a) neither A_1 nor A_2 constitutes a fair dominating set of G, and (b) $A_1 \cup A_2$ constitutes a fair dominating set of G.

A fair coalition partition of a graph G is a partition $\Upsilon = \{A_1, A_2, \ldots, A_k\}$ of its vertex set such that no subset of Υ acts as a fair dominating set of G, but for every set $A_i \in \Upsilon$, there exists a set $A_j \in \Upsilon$ such that A_i and A_j combine to form a fair coalition. We define the fair coalition number of G as the maximum cardinality of a fair coalition partition of G, and we denote it by $\mathcal{C}_f(G)$. We initiate the study of the fair coalition in graphs and obtain $\mathcal{C}_f(G)$ for some specific graphs.

This is a joint work with Saeid Alikhani.

Keywords: Fair domination, Fair coalition, cycle.