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COMPLEXITY RESULTS ON LOCALLY-BALANCED 2-PARTITIONS OF BIPARTITE GRAPHS

A 2-partition $f : V(G) \to \{0,1\}$ of a graph G is *locally-balanced with an open (closed) neighbourhood* if for every $v \in V(G)$,

$$||\{u \in N_G(v)\colon f(u) = 1\}| - |\{u \in N_G(v)\colon f(u) = 0\}|| \leq 1$$

$$(||\{u \in N_G[v]\colon f(u) = 1\}| - |\{u \in N_G[v]\colon f(u) = 0\}|| \leq 1),$$

where $N_G(v) = \{u \in V(G)\colon uv \in E(G)\}$ $(N_G[v] = N_G(v) \cup \{v\})$.

The concept of locally-balanced 2-partition of graphs was introduced by Balikyan and Kamalian [1] in 2005. In this talk we consider the following problems:

Problem 1.

Instance: A $(3,8)$-biregular bipartite graph G.

Question: Does G has a locally-balanced 2-partition with an open neighbourhood?

Problem 2.

Instance: An even bipartite graph G with $\Delta(G) = 4$.

Question: Does G has a locally-balanced 2-partition with an open neighbourhood?

Problem 3.

Instance: A bipartite graph G with $\Delta(G) = 3$.

Question: Does G has a locally-balanced 2-partition with a closed neighbourhood?

In this talk we show that Problems 1-3 are NP-complete.

This is joint work with Petros Petrosyan.

References

[1] S.V. Balikyan, R.R. Kamalian, *On NP-completeness of the problem of existence of locally-balanced 2-partition for bipartite graphs G with* $\Delta(G) = 3$, Doklady NAN RA, 105(1), 2005, pp. 21-27.