Discussiones Mathematicae Graph Theory 38 (2018) 27–37 doi:10.7151/dmgt.1994



A CHARACTERIZATION FOR 2-SELF-CENTERED GRAPHS

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Abstract

A graph is called 2-self-centered if its diameter and radius both equal to 2. In this paper, we begin characterizing these graphs by characterizing edge-maximal 2-self-centered graphs via their complements. Then we split characterizing edge-minimal 2-self-centered graphs into two cases. First, we characterize edge-minimal 2-self-centered graphs without triangles by introducing *specialized bi-independent covering* (SBIC) and a structure named *generalized complete bipartite graph* (GCBG). Then, we complete characterization by characterizing edge-minimal 2-self-centered graphs with some triangles. Hence, the main characterization is done since a graph is 2-selfcentered if and only if it is a spanning subgraph of some edge-maximal 2-self-centered graphs and, at the same time, it is a spanning supergraph of some edge-minimal 2-self-centered graphs.

Keywords: self-centered graphs, specialized bi-independent covering (SBIC), generalized complete bipartite graphs (GCB).

2010 Mathematics Subject Classification: 05C12, 05C69.

References

- J. Akiyama, K. Ando and D. Avis, Miscellaneous properties of equi-eccentric graphs, in: Convexity and Graph Theory (Jerusalem, 1981), North-Holland Math. Stud., Amsterdam 87 (1984) 13–23. doi:10.1016/s0304-0208(08)72802-0
- [2] K. Balakrishnan, B. Brešar, M. Changat, S. Klavžar, I. Peterin and A.R. Subhamathi, Almost self-centered median and chordal graphs, Taiwanese J. Math. 16 (2012) 1911–1922.
- [3] F. Buckley, Self-centered graphs, in: Graph Theory and Its Applications: East and West (Jinan, 1986), Ann. New York Acad. Sci. 576 (1989) 71–78. doi:10.1111/j.1749-6632.1989.tb16384.x
- F. Buckley, Z. Miller and P.J. Slater, On graphs containing a given graph as center, J. Graph Theory 5 (1981) 427–434. doi:10.1002/jgt.3190050413
- [5] J.L. Gross, J. Yellen and P. Zhang, Handbook of Graph Theory, Second Edition (CRC Press., 2014).
- [6] S. Klavžar, K.P. Narayankar and H.B. Walikar, *Almost self-centered graphs*, Acta Math. Sin. (Engl. Ser.) 27 (2011) 2343–2350.
- [7] S. Negami and G.H. Xu, *Locally geodesic cycles in 2-self-centered graphs*, Discrete Math. 58 (1986)263–268. doi:10.1007/s10114-011-9628-3

Received 30 November 2015 Revised 24 August 2016 Accepted 1 September 2016