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RESTRAINED DOMINATION IN SELF-COMPLEMENTARY GRAPHS

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Abstract

A self-complementary graph is a graph isomorphic to its complement. A set S of vertices in a graph G is a restrained dominating set if every vertex in $V(G) \setminus S$ is adjacent to a vertex in S and to a vertex in $V(G) \setminus S$. The restrained domination number of a graph G is the minimum cardinality of a restrained dominating set of G. In this paper, we study restrained domination in self-complementary graphs. In particular, we characterize the self-complementary graphs having equal domination and restrained domination numbers.

Keywords: domination, complement, restrained domination, self-complementary graph.

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References

[1] J. Akiyama and F. Harary, *A graph and its complement with specified properties. IV. Counting self-complementary blocks*, J. Graph Theory **5** (1981) 103–107. doi:10.1002/jgt.3190050108

[2] B. Bollobás and E.J. Cockayne, *Graph-theoretic parameters concerning domination, independence, and irredundance*, J. Graph Theory **3** (1979) 241–249. doi:10.1002/jgt.3190030306

[3] E.J. Cockayne, O. Favaron, C.M. Mynhardt and J. Puech, *A characterization of* (γ, i)*-trees*, J. Graph Theory **34** (2000) 277–292.

[4] W.J. Desormeaux, T.W. Haynes and M.A. Henning, *Domination parameters of a graph and its complement*, Discuss. Math. Graph Theory **38** (2018) 203–215. doi:10.7151/dmgt.2002

[5] G.S. Domke, J.H. Hattingh, S.T. Hedetniemi, R. Laskar and L.R. Markus, *Restrained domination in graphs*, Discrete Math. **203** (1999) 61–69. doi:10.1016/S0012-365X(99)00016-3

[6] G.S. Domke, J.H. Hattingh, M.A. Henning and L.R. Markus, *Restrained domination in trees*, Discrete Math. **211** (2000) 1–9. doi:10.1016/S0012-365X(99)00036-9

[7] M. Dorfling, W. Goddard, M.A. Henning and C.M. Mynhardt, *Construction of trees and graphs with equal domination parameters*, Discrete Math. **306** (2006) 2647–2654. doi:10.1016/j.disc.2006.04.031

[8] P. Erdős and A. Rényi, *Asymmetric graphs*, Acta Math. Acad. Sci. Hungar. **14** (1963) 295–315. doi:10.1007/BF01895716

[9] R.A. Gibbs, *Self-complementary graphs*, J. Combin. Theory Ser. B **16** (1974) 106–123. doi:10.1016/0095-8956(74)90053-7

[10] A. Hansberg, B. Randerath and L. Volkmann, *Claw-free graphs with equal* 2*-domination and domination numbers*, Filomat **30** (2016) 2795–2801. doi:10.2298/FIL1610795H

[11] J.H. Hattingh and M.A. Henning, *Characterizations of trees with equal domination parameters*, J. Graph Theory **34** (2000) 142–153. doi:10.1002/1097-0118(200006)34:2⟨142::AID-JGT3⟩3.0.CO;2-V

[12] J.H. Hattingh and E.J. Joubert, *Equality in a bound that relates the size and the restrained domination number of a graph*, J. Comb. Optim. **31** (2016) 1586–1608. doi:10.1007/s10878-015-9843-4

[13] J.H. Hattingh and E.J. Joubert, *The product of the total restrained domination numbers of a graph and its complement*, Australas. J. Combin. **70** (2018) 297–308.

[14] T.W. Haynes, S.T. Hedetniemi and P.J. Slater, Fundamentals of Domination in Graphs (Marcel Dekker, Inc., New York, 1998).

[15] T.W. Haynes, S.T. Hedetniemi and P.J. Slater, Domination in Graphs: Advanced Topics (Marcel Dekker, Inc., New York, 1998).

[16] M.A. Henning, *Graphs with large restrained domination number*, Discrete Math. **197/198** (1999) 415–429. doi:10.1016/S0012-365X(99)90095-X

[17] M.A. Henning and A. Yeo, Total Domination in Graphs (Springer, New York, 2013). doi:10.1007/978-1-4614-6525-6

[18] C. Lee, *The domination number of a tournament*, Kangweon-Kyungki Math. J. **9** (2001) 21–28.

[19] R. Molina, *On the structure of self-complementary graphs*, in: Proc. 25th Southeastern Internat. Conf. on Combinatorics, Graph Theory, Computing (Boca Raton, FL, 7–11 March 1994).

[20] P.S. Nair, *Construction of self-complementary graphs*, Discrete Math. **175** (1997) 283–287.
doi:10.1016/S0012-365X(96)00127-6

[21] P.R.L. Pushpam and C. Suseendran, *Further results on secure restrained domination in graphs*, J. Discrete Math. Sci. Cryptogr. **19** (2016) 277–291.
doi:10.1080/09720529.2014.1001590

[22] Z. Li and J. Xu, *A characterization of trees with equal independent domination and secure domination numbers*, Inform. Process. Lett. **119** (2017) 14–18.
doi:10.1016/j.ipl.2016.11.004

[23] H. Sachs, *Über selbstkomplementäre Graphen*, Publ. Math. Debrecen **9** (1962) 270–288.

[24] B. Samadi, H.R. Golmohammadi and A. Khodkar, *Bounds on several versions of restrained domination numbers*, Contrib. Discrete Math. **12** (2017) 14–19.

[25] S. Skiena, *Self-complementary graphs*, in: Implementing Discrete Mathematics: Combinatorics and Graph Theory with Mathematica (Addison-Wesley, Redwood City, CA, 1990).

[26] J.A. Telle, Vertex Partitioning Problems: Characterization, Complexity and Algorithms on Partial k-Trees, Ph.D. Thesis (University of Oregon, 1994).

[27] J.A. Telle and A. Proskurowski, *Algorithms for vertex partitioning problems on partial k-trees*, SIAM J. Discrete Math. **10** (1997) 529–550.
doi:10.1137/S0895480194275825

[28] W.C.K. Yen, *Weighted restrained domination in subclasses of planar graphs*, Theoret. Comput. Sci. **630** (2016) 13–25.
doi:10.1016/j.tcs.2016.03.022

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