ICMASE 2025

APPLIED MATHEMATICAL ANALYSIS OF PERFECT DOMINATION IN OTTOMAR GRAPHS

Saja S. Abed[1,*], Saba S. Majeed[2], Khalid S. Munshid[3]

[1]*Department of Electrical Engineering, Technology - Iraq University, Baghdad, Iraq*
[2]*Department of Petroleum Engineering, College of Engineering, Baghdad University, Baghdad, Iraq*
[3]*College of Computer Science and Information Technology, Sumer University, Thi Qar, Iraq*

ABSTRACT

If $N(V) \cup S \neq \emptyset$, then a set $S \subseteq V(G)$ is a dominate set in G. For each vertex $v \in V - S$. The dominance number of G, represented as $\gamma(G)$, is the minimal cardinality of all dominating sets in the graph. Now what do we mean by perfect domination? Suppose G is graph, simple and connected. If exactly one element of S dominates $x \in V(G)\backslash S$, then the dominating set $S \subseteq V(G)$ is termed to as the perfect dominating set of G. The minimum cardinality of a perfect dominating set of G is a perfect domination number, denoted as $\gamma_p(G)$. The Ottomar graph, represented in this study as $O_{(n,m)}$, is the graph C_n, $n \in \mathbb{Z}^+$, $n \geq 3$, with a vertex connected to a vertex of C_m, $m \in \mathbb{Z}^+$, $n \geq 3$ by a path P_2. C_m is called foot (plural: feet), while C_n is called the heart. In this work, dominating, inverse dominating, and the perfect domination number of an Ottomar graph are studied. The minimal cardinality of a perfect dominating number of an Ottomar graph is represented by $\gamma_p(O_{n,m})$. We also study the invers perfect dominate of Ottomar $\gamma_p^{-1}(O_{n,m})$, then the perfect, dominating set of $\gamma_p^{-1}(O_{n,m})$ cardinality is called $\gamma_p^{-1}(O_{n,m})$-set.

***K*eywords** Ottomar graph · Perfect domination · Domination · Inverse · Inverse domination · Inverse perfect domination

References

[1] Ore, O. (1990). Graphs and their uses (Vol. 34). Cambridge University Press.

[2] Livingston, M., & Stout, Q. F. (1990). Perfect dominating sets. University of Michigan, Computer Science and Engineering Division, Department of Electrical Engineering and Computer Science.

[3] Salah, S., Omran, A. A., & Al-Harere, M. N. (2022). Calculating Modern Roman Domination of Fan Graph and Double Fan Graph. Journal of Applied Sciences and Nanotechnology, 2(2).

[4] Al-Harere, M. N., & Breesam, A. T. (2019, April). Further results on bi-domination in graphs. In AIP Conference Proceedings (Vol. 2096, No. 1). AIP Publishing.

[5] Caay, M., & Arugay, E. (2016). On Chromatic Number and Edge-Chromatic Number of the Ottomar Graph. American Scientific Research Journal for Engineering, Technology and Science, 98-107.

[6] Brualdi, R. A. (2006). Combinatorial matrix classes (Vol. 13). Cambridge University Press.

[7] Kulli, V. R., & Sigarkanti, S. C. (1991). Inverse domination in graphs. Nat. Acad. Sci. Lett, 14(12), 473-475.

[8] Abed, S. S., & Al-Harere, M. N. (2022). Rings domination in graphs. International Journal of Nonlinear Analysis and Applications, 13(2), 1833-1839.

[*]*Corresponding Author's E-mail: as.20.23@grad.uotechnology.edu.iq*

[9] Saja Saeed Abed, M. N. Al-Harere, On Rings Domination in Graphs International Journal of Mathematics and Computer Science, 17(2022), no. 3, 1313–1319.

[10] Abdlhusein, M. A., & Al-Harere, M. N. (2021). New parameter of inverse domination in graphs. Indian Journal of Pure and Applied Mathematics, 52(1), 281-288.

[11] Omran, A. A., Al-Harere, M. N., & Kahat, S. S. (2022). Equality co-neighborhood domination in graphs. Discrete Mathematics, Algorithms and Applications, 14(01), 2150098.

[12] Salve, D. P., & Enriquez, E. L. (2016). Inverse perfect domination in graphs. Global Journal of Pure and Applied Mathematics, 12(1), 1-10.

[13] Abdlhusein, M. A., & Al-Harere, M. N. (2022). Some modified types of pitchfork domination and its inverse. Bol. Soc. Paran. Mat, 40, 1-9.

[14] Majeed, S. S., Omran, A. A. A., & Yaqoob, M. N. (2022). Modern Roman domination of corona of cycle graph with some certain graphs. Computer Science, 17(1), 317-324.

[15] Salah, S., Omran, A. A., & Al-Harere, M. N. (2022, January). Modern roman domination on two operations in certain graphs. In AIP Conf. Proc (Vol. 2386).

[16] Munshid, K. S. Hamid, M. F. Kider, J. R. Principally self injective modules, International Journal of Mathematics and Computer Science, 17, no. 1, (2022), 255–263.

[17] Munshid, K. S. Hamid, M. F. Kider, Principally pure submodules, International Journal of Mathematics and Computer Science, 17, no. 2, (2022), 917–922.

[18] Munshid, K. S. Muttair, H. H. Majeed, S. S. Chained Hesitant Fuzzy R-Modules, International Journal of Mathematics and Computer Science, 20, no. 1, (2025), 439–446.