

# COMBINATORIAL APPROACH IN COUNTING INDUCED PATHS IN A GRAPH: POLYNOMIAL REPRESENTATIONS

CERINA A. VILLARTA

*Central Mindanao University, Philippines*

e-mail: f.cerina.villarta@cmu.edu.ph

Let  $G$  be a connected graph. An induced path in  $G$  is a path in  $G$  induced by a subset of  $V(G)$ . The induced path polynomial of  $G$ , denoted by  $P(G; x)$ , is the generating function of the sequence  $\langle p_i(G) \rangle_{i=0}^{\infty}$ , where  $p_i(G)$  is the number of induced paths in  $G$  of order  $i$ . In this paper, we characterized the induced paths of some special classes of graphs such as path, cycle, fan, wheel, star-graph, and complete graph, and established the explicit forms of the induced path polynomials of these graphs using some combinatorial approaches. Moreover, we established some relationships between the algebraic properties of this polynomial with respect to the graph-theoretic properties of the given graph.

## References

- [1] J. Ellis-Monaghan, J. Merino. *Graph Polynomials and Their Applications II: Interrelations and Interpretations*. Birkhauser, Boston, 2011.
- [2] E.J. Farrell. A note on the clique polynomial and its relation to other graph polynomials. *J. Math.Sci. Calcutta*, 8:97-102, 1997.
- [3] I. Gutman, F. Harary. Generalizations of the Matching Polynomial. *Utilitas Mathematica*, 24:97-106, 1983.
- [4] F. Harary. *Graph Theory*. CRC Press, Boca Raton, 2018.
- [5] C. Hoede, X. Li. Clique Polynomials and independent set Polynomials of Graphs. *Discrete Mathematics*, 125:219-228, 1994.
- [6] R.E. Madalim, R.G. Eballe, A.H. Arajaini, R.G. Artes, Jr. Induced cycle polynomial of a graph. *Advances and Applications in Discrete Mathematics*, 38(1):83-94, 2023. <http://dx.doi.org/10.17654/0974165823020>