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Reciprocal Complementary Wiener Index of Molecular Graph of Naphthalene based on Domination

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Abstract. This paper obtains Reciprocal Complementary Wiener Index of the molecular graph of Naphthalene byusing Minimum Dominating Distance Matrix.

Keywords: Domination, Minimum Dominating Distance matrix, Reciprocal ComplementaryWiener Index.

1.Introduction

In graph theory, there are numerous stable polynomials who can be applied to any graph and often have numeric coefficients. Furthermore, Chemical Graph Theory is a branch of Mathematics which links Graph Theory and Chemistry. Topological indices are exact numbers that relate to a molecule's structural graph [3,4]. In regards of measures based on distance, eccentricity is possibly a lot safer concept than closeness. Researchers can track a network's growth over time by using its diameter. A network with a high diameter contains different associations. Throughout this paper, graphs are taken into a consideration as simple, connected, finite, undirected graphs. Here Consider G as Molecular Graph where atoms and bonds are specified by vertices and edges respectively.

2.Preliminaries

This section presents some basic relevant notions.

2.1Minimum DominatingSet[1,2]

Let 'G' be a graph. A set D in a graph 'G' is a dominating set if each vertex is either in D or adjacent to a vertex in D. Any dominating set with minimum cardinality is called a minimum dominating set.

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2.2 Diameter [1,2]

Eccentricity of a vertex v, e(v) is the maximum distance from v to any other vertex. The diameter of the graph is the length of the longest shortest path.

2.3MinimumDominatingDistanceMatrix[5,6, 9,10]

Let D be a minimum dominating set of a graph G. The minimum dominating distance matrix of G is N x N matrix defined by

MDDMG) =(d_{ij}) where d_{ij} =

$$\begin{cases} 1 & if \quad i = j \ and \ v_i \epsilon \ D \\ d(v_i, v_j) & otherwise \end{cases}.$$

2.4 Reciprocal Complementary Wiener Index [7,8]

The complementary distance between the vertices v_i and v_j , denoted by Cij is

$Cij = 1 + D - dij$where D is the diameter of the graph G. The reciprocal complementary Wiener index of a graph G is defined as$RCW(G) = \sum_{i<j} \frac{1}{1+D-dij}$.

2.5 Molecular GraphofNaphthalene [6,9,10]

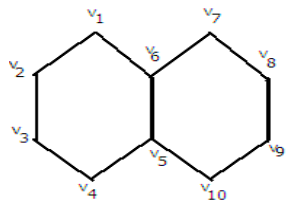

Figure 1. Molecular Graph of Naphthalene

Here Dominating set D= { v_3 ,v_6,v_9 } and V-D ={v_1,v_2,v_4,v_5, v_7,v_8,v_{10} }.

2.6 Minimum Dominating Distance Matrix of Naphthalene [6,9,10]

	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}
V_1	0	1	2	3	2	1	2	3	4	3
V_2	1	0	1	2	3	2	3	4	5	4
V_3	2	1	1	1	2	3	4	5	4	3
V_4	3	2	1	0	1	2	3	4	3	2
V_5	2	3	2	1	0	1	2	3	2	1
V_6	1	2	3	2	1	1	1	2	3	2
V_7	2	3	4	3	2	1	0	1	2	3
V_8	3	4	5	4	3	2	1	0	1	2
V_9	4	5	4	3	2	3	2	1	1	1
V_{10}	3	4	3	2	1	2	3	2	1	0

3. Main Results

In this Section, it finds Reciprocal Complementary Wiener Index of the molecular graph of Naphthalene.

Using the minimum dominating distance matrix, the distance of dominating vertices of itself is considered as 1. Here these distances

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are included to the computations. The following Table 1 gives the eccentricity of each vertex for the molecular graph of Naphthalene and Table 2 computes ReciprocalComplementary Wiener Index for the molecular graph of Naphthalene.

Table 1. Eccentricity of Molecular Graph

Vertex	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}
Eccentricity	4	5	5	4	3	3	4	5	5	4

Table 2. Computation of Reciprocal Complementary Wiener Index for the molecular graph of Naphthalene

Cij = 1 + D - $d_{ij}$when i< j											$\sum_{i<j} \frac{1}{1+D-dij}$
	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	
V_1	6	5	3	4	5	5	4	3	2	3	2.67
V_2	-	6	5	4	3	4	3	2	1	2	3.47
V_3	-	-	5	5	4	3	2	1	2	3	3.25
V_4	-	-	-	6	5	4	3	2	3	4	1.97
V_5	-	-	-	-	6	5	4	3	4	5	1.37
V_6	-	-	-	-	-	5	5	4	3	4	1.2
V_7	-	-	-	-	-	-	6	5	4	3	0.92
V_8	-	-	-	-	-	-	-	6	5	4	0.62
V_9	-	-	-	-	-	-	-	-	5	5	0.4
V_{10}	-	-	-	-	-	-	-	-	-	6	0.17
										Grand Total	16.04

Reciprocal Complementary Wiener Index of Naphthaleneusing Minimum Dominating Distance Matrix *RCW(G)*=**16.04**

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4.CONCLUSION

This Paper obtained Reciprocal Complementary Wiener Index of the Molecular graph of Naphthalene using Minimum Dominating Distance Matrix.

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