

Dakshayani Indices of Derived Graphs of Subdivision of Crown Graph

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***Abstract*—In theoretical Chemistry, the physico-chemical properties of chemical compounds are often modeled by means of molecular graphbased structure descriptors, which are also referred to as topological indices.**

**The derived graph of a simple graph G, denoted by G^+, is the graph having the same vertex set of$G$ and two vertices are adjacent if and only if their distance in G is two. In this paper, we compute generalized,Dakshayani, first and second neighbor-
hood Dakshayani, indices, first and second hyper neighbourhood. Dakshayani indices, the minus and square neighbourhoodDakshayani indices and F_1- neighbourhood Dakshayani indices of the derived graph of subdivison graph of a crown graph.**

Keywords—Dakshayani index, derived graph, line graph, subdivision graph.

INTRODUCTION

Graph Theory is a branch of mathematics which used al most all fields of mathematics. Chemical graph theory deals with the discussion of chemical compounds using simple graphs. A graph G consists of vertices and edges such that chemical compound atoms can be taken by vertices and edges between the atoms of edges. The degree $d_G(v)$ is the number of edges incident with the vertex v and is known as degree of a vertex v. The topological indices which are the numerical quantities that that are used to determine the properties of chemical compounds. The chemical graph theory has its application in the development of chemical sciene and medical science. The mathematical Chemistry that has so many offers with topological indices used for QSAR / QSPR study. For discussion of topological indices, we see. In this purposed work. We use some degree-based topological indices such as generalisedDakshayani index, the first and second neighbourhood Dakshayani indices, the first and second hyper neighbourhood Dakshayani indices, the minus and square neighbourhood Dakshayani indices on the derived graph of subdivision graph of a crown graph.

We consider here the graphs with $V(G)$ and $E(G)$ are the vertices and edges of G respectively. Denote $d_G(v)$ for the degree of vertex v. The Complement $\overline{G}$ of G is the graph with vertex as $V(G)$ and two vertices in $\overline{G}$are adjacent if and only if they are not adjacent in G. Also the set of all vertices adjacent to v is called open neighbourhood of v and is denoted by $N_G(v)$.The closed neighbourhood of v is denoted by $N_G[v] = N_G(v) \cup \{v\}$.

We consider the notation

$D_G(v) = d_G(v) + \sum_{u \in N_G(v)} d_G(v)$ is the degree sum of closed neighbourhood of vertices of v. For any other undefined notations are terminology, we refer the readers to [8].

The ordinary Subdivision graph $S(G)$ of a graph G is obtained from G by inserting a new vertex of degree 2 on each edge of G.

The line graph $L(G)$ of G is the graph whose vertices are in one-to-one correspondence with the edges

of G and two vertices of $L(G)$ are adjacent if and only if the corresponding edges in G share a common vertex.
In [6], V. R. kulli, proposed the generalized Dakshayani index, which the defined as

$$DK^{\alpha}(G) = \sum_{v\in V(G)} d_{\overline{G}}(v)\, d_G(v)^{\alpha} \text{ -------- } (1.1)$$

where α is any real number

By the motivation of first and second Zagreb indices introduced by Gutman and Trinajstic [2] ,V.R. Kulli in [4], defined the new degree based topological indices as follows.
The first neighbourhoodDakshayani index is defined as

$$ND_1(G) = \sum_{uv\in E(G)}[D_G(u) + D_G(v)] \text{ -------- } (1.2)$$

The Second neighbourhoodDakshayani index is defined as

$$ND_2(G) = \sum_{uv\in E(G)} D_G(u)D_G(v) \text{ -------- } (1.3)$$

The first hyper neighbourhoodDakshayani index is defined as

$$HND_1(G) = \sum_{uv\in E(G)}[D_G(u) + D_G(v)]^2 \text{ -------- } (1.4)$$

The second hyper neighbourhoodDakshayani index is defined as

$$HND_2(G) = \sum_{uv\in E(G)}[D_G(u)D_G(v)]^2 \text{ -------- } (1.5)$$

The minus neighbourhoodDakshayani index is defined as

$$MND(G) = \sum_{uv\in E(G)}[D_G(u) - D_G(v)] \text{ -------- } (1.6)$$

The square neighbourhoodDakshayani index is defined as

$$QND(G) = \sum_{uv\in E(G)}[D_G(u) - D_G(v)]^2 \text{ -------- } (1.7)$$

II CROWN GRAPH

A cycle C_n with an end edge or a pendant edge attached at each vertex is called a crown graph CW_n [1].

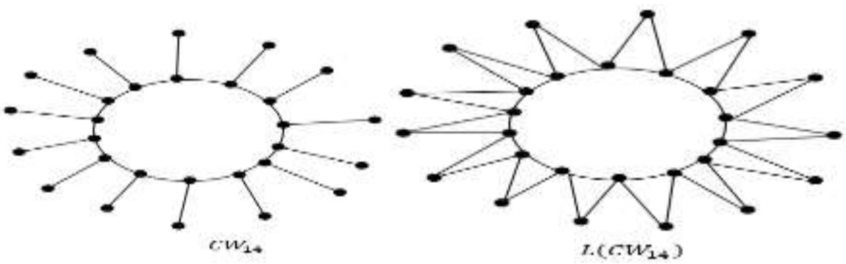

Table 1: The edge partition of Crown graph

$(d_{CW_n}(u), d_{CW_n}(v))$, where $uv \in E(CW_n)$	(1,3)	(3,3)
Number of edges	n	n

Table 2. The edge partition of crown graph

$(D_{CW_n}(u), D_{CW_n}(v))$, where $uv \in E(CW_n)$	(4,10)	(10,10)

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Number of edges	n	n

Table 3. The edge partition of line graph of crown graph

$(d_{L(CW_n)}(u), d_{L(CW_n)}(v),$ where $uv \in E(L(CW_n))$	(2,4)	(4,4)
Number of edges	$2n$	n

Table 4. The edge partition of line graph of crown graph.

$(D_{L(CW_n)}(u), D_{L(CW_n)}(v),$ where $uv \in E(L(CW_n))$	(10,16)	(16,16)
Number of edges	$2n$	n

Definition 2.1. [3] Let Gbe any simple graph. Then it derived graph $[G]^+$ is the graph whose vertices are same as the vertices of G and two vertices in $[G]^+$ are adjacent if and only if the distance between them in G is two.

Theorem 2.3 Let$G = CW_n$ be a crown graph. Then simple graph. Then
1.$DK^{\alpha}(G) = 2n[n(1 + 3^{\alpha}) - (1 + 2.3^{\alpha})]$
2.$ND_1(G) = 34n$
3.$ND_2(G) = 140n$
4.$HND_1(G) = 2000n$
5.$HND_1(G) = 1160n$
6.$MND(G) = 6n$
7.$QND(G) = 36n$
8.$F_1ND(G) = 316n$

Proof.

The Crown graph $G = CW_n$ has $2n$-vertices and $2n$-edges. From this $2n$-vertices, n-vertices are of degree 1 and n −vertices of degree 3. Therefore in $\overline{G}$,among the 2n-vertices, n-vertices of degree (2n-2) and n-vertices of degree $(2n - 4)$. Also, we get that edge partition, based on the degree of vertices shown in Table 1 and Table 2. Using formulae (1.1) - (1.8) to this information from Table 1 and 2, we obtain the required result.

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