Research Article

Multiplicative Valency-Based Descriptors for Silicon Carbides $\text{Si}_2\text{C}_3 - \text{I}[p,q]$, $\text{Si}_2\text{C}_3 - \text{II}[p,q]$, $\text{Si}_2\text{C}_3 - \text{III}[p,q]$, and $\text{SiC}_3 - \text{III}[p,q]$ in Drug Applications

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Topological indices help us to collect information about algebraic graphs and give us a mathematical approach to understand the properties of algebraic structures. In literature, there are more than 148 topological indices, but none of them can completely describe all properties of chemical compounds. Together, they do it to some extent, so there is always room to define new topological indices. In this paper, we introduced the multiplicative version of Shingali and Kanabur indices and computed these indices for Silicon Carbides $\text{Si}_2\text{C}_3 - \text{I}[p,q]$, $\text{Si}_2\text{C}_3 - \text{II}[p,q]$, $\text{Si}_2\text{C}_3 - \text{III}[p,q]$, and $\text{SiC}_3 - \text{III}[p,q]$.  

1. Introduction

In discrete mathematics, graph theory is not only the study of different properties of objects, but it also tells us about objects having the same properties as investigating objects [1]. These properties of different objects are of main interest. In particular, graph polynomials related to graph are rich in information. Mathematical tools like polynomials and topological based numbers have significant importance in collecting information about the properties of chemical compounds. We can find out much hidden information about compounds through these tools [2].

Actually, topological indices are numeric quantities that tell us about the whole structure of graph. There are many topological indices that help us to study physical, chemical reactivities, and biological properties [3–5]. Wiener, in 1947, firstly introduced the concept of the topological index while working on a boiling point [6]. In particular, Hosoya polynomial [7] plays an important role in the area of distance-based topological indices; we can find out Wiener index, hyper-Wiener index, and Tratch-stankevich-zefirove index by Hosoya polynomial [8]. In the whole paper, we take $d_u$ a degree of vertex $u$ which is equal to the number of vertices that are at a distance one from $u$.

Gutman and Trinajstić introduced the first and second Zagreb indices, which are defined as follows:

\[
M_1 (G) = \sum_{uv \in E(G)} (d_u + d_v),
\]

\[
M_2 (G) = \sum_{uv \in E(G)} (d_u \times d_v),
\]

respectively. Further details about these indices can be found in reference [9].

The modified Randić index is defined as follows:

\[
R^\prime (G) = \frac{1}{\max\{d_u, d_v\}}.
\]

Shigehalli and Kanabur [9] introduced the following new degree-based topological indices. Arithmetic-Geometric index is defined as follows:
Shigehalli and Kanabur indices are defined as follows:

\[ \text{MSK}_1(G) = \frac{d_u \times d_v}{2} \]

\[ \text{MSK}_2(G) = \left( \frac{d_u + d_v}{2} \right)^2 \]

Our aim is to introduce the multiplicative version of Shigehalli and Kanabur indices and modify the Randić index. The multiplicative modified Randić index is defined as follows:

\[ \text{MR}'(G) = \prod_{uv \in E(G)} \frac{1}{\max\{d_u, d_v\}} \]

The multiplicative version of Shigehalli and Kanabur indices and multiplicative Arithmetic-Geometric index are defined as follows:

\[ \text{MAG}_1 = \prod_{uv \in E(G)} \frac{d_u + d_v}{2 \sqrt{d_u \times d_v}} \]

\[ \text{MSK}(G) = \prod_{uv \in E(G)} \frac{d_u + d_v}{2} \]

\[ \text{MSK}_1(G) = \prod_{uv \in E(G)} \frac{d_u \times d_v}{2} \]

\[ \text{MSK}_2(G) = \prod_{uv \in E(G)} \left( \frac{d_u + d_v}{2} \right)^2 \]

For detailed study about topological indices and their applications, we refer [10, 11] and references therein. It is a proven fact that topological indices help to predict many properties without going to the wet lab [12–17]. For example, the first and second Zagreb indices were found to happen for the calculation of the \(\pi\)-electron energy of dendrimers, the Randić index corresponds with boiling point, the atomic bond connectivity (ABC) index gives an exceptionally decent relationship to figuring the strain energy of dendrimers and augmented Zagreb index is a good tool to guess the heat of formation of dendrimers, etc. There are more than around about 148 topological indices, but none of them can completely describe all properties of a chemical compound. Therefore there is always room to define and study new topological indices. Redefined Zagreb indices are one step in this direction and are very close to Zagreb indices. Zagreb indices are very well studied by chemists and mathematicians due to their huge applications in chemistry [18–22].

In this paper, we aim to compute the above newly defined topological indices of Silicone Carbides \(\text{Si}_2\text{C}_3 - I[p, q], \text{Si}_2\text{C}_3 - II[p, q], \text{Si}_2\text{C}_3 - III[p, q]\), and \(\text{SiC}_3 - III[p, q]\).

2. Computational Results

In this section, we give our main results.

2.1. Multiplicative Shingali and Kanabour Indices for \(\text{Si}_2\text{C}_3 - I[p, q]\). In order to describe the molecular graph of \(\text{Si}_2\text{C}_3 - I\), we have set this way. We define \(p\) as the number of connected units in a row (chain) and \(p\) as the number of connected rows, the number of \(p\) cells per connection. In Figures 1 and 2, we demonstrate how cells are connected in one row (chain) and how one row is connected to another row. For \(\text{Si}_2\text{C}_3 - I[p, q]\), \(V(\text{Si}_2\text{C}_3 - I[p, q]) = 10pq\) and \(E(\text{Si}_2\text{C}_3 - I[p, q]) = 15pq - 2p - 3q\).

The degree-based edge partition of \(\text{Si}_2\text{C}_3 - I\) is given in Table 1, which can be obtained easily by counting methods form Figures 1 and 2.

\[ AG_1 = \sum_{uv \in E(G)} \frac{d_u + d_v}{2 \sqrt{d_u \times d_v}} \]
Proof.

\[ M_{\{Si_{2}C_{3}-1|p,q\}} = \left( \frac{1}{\sqrt{1+2}} \right)^{(1)} \times \left( \frac{1}{\sqrt{1+3}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2+2}} \right)^{(1)} \times \left( p + 2q \right) \]
\[ \times \left( \frac{1}{\sqrt{2+3}} \right)^{(p+2q)} \times \left( \frac{1}{\sqrt{3+3}} \right)^{(3p(5q-3) - 13q + 7)} \]
\[ = \frac{1}{20} \sqrt{10} \left( p + 2q \right) (3 (2p - 3) + 8q) (3p(5q - 3) - 13q + 7), \]

\[ M_{R}^{\prime} (\{Si_{2}C_{3}-1|p,q\}) = \prod_{uv \in E \{\{Si_{2}C_{3}-1|p,q\}\}} \frac{1}{\max\{d_u, d_v\}} \]
\[ = \left( \frac{1}{\sqrt{3}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2}} \right)^{(p+2q)} \]
\[ \times \left( \frac{1}{\sqrt{2}} \right)^{(3(2p - 3) + 8q)} \times \left( \frac{1}{\sqrt{3}} \right)^{(3p(5q-3) - 13q + 7)} \]
\[ = \frac{1}{108} \left( p + 2q \right) (3 (2p - 3) + 8q) (3p(5q - 3) - 13q + 7), \]

\[ M_{G_{1}} (\{Si_{2}C_{3}-1|p,q\}) = \prod_{uv \in E \{\{Si_{2}C_{3}-1|p,q\}\}} \frac{d_u + d_v}{2(\max\{d_u, d_v\})} \]
\[ = \left( \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{3}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{3}} \right)^{(1)} \times \left( \frac{2+2}{\sqrt{2} \times 2} \right)^{(p+2q)} \]
\[ \times \left( \frac{2+3}{\sqrt{2} \times 3} \right)^{(3(2p - 3) + 8q)} \times \left( \frac{3+3}{\sqrt{3} \times 3} \right)^{(3p(5q - 3) - 13q + 7)} \]
\[ = \frac{5}{4} \left( p + 2q \right) (3 (2p - 3) + 8q) (3p(5q - 3) - 13q + 7), \]

\[ M_{S_{1}} (\{Si_{2}C_{3}-1|p,q\}) = \prod_{uv \in E \{\{Si_{2}C_{3}-1|p,q\}\}} \frac{d_u + d_v}{2} \]
\[ = \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{2+2}{\sqrt{2} \times 2} \right)^{(p+2q)} \]
\[ \times \left( \frac{2+3}{\sqrt{2} \times 2} \right)^{(3(2p - 3) + 8q)} \times \left( \frac{3+3}{\sqrt{2} \times 3} \right)^{(3p(5q - 3) - 13q + 7)} \]
\[ = 45 \left( p + 2q \right) (3 (2p - 3) + 8q) (3p(5q - 3) - 13q + 7), \]

\[ M_{S_{1}} (\{Si_{2}C_{3}-1|p,q\}) = \prod_{uv \in E \{\{Si_{2}C_{3}-1|p,q\}\}} \frac{d_u \times d_v}{2} \]
\[ = \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{2+2}{\sqrt{2} \times 2} \right)^{(p+2q)} \]
\[ \times \left( \frac{2+3}{\sqrt{2} \times 2} \right)^{(3(2p - 3) + 8q)} \times \left( \frac{3+3}{\sqrt{2} \times 3} \right)^{(3p(5q - 3) - 13q + 7)} \]
\[ = 81 \left( p + 2q \right) (3 (2p - 3) + 8q) (3p(5q - 3) - 13q + 7), \]

\[ M_{S_{2}} (\{Si_{2}C_{3}-1|p,q\}) = \prod_{uv \in E \{\{Si_{2}C_{3}-1|p,q\}\}} \left( \frac{d_u + d_v}{2} \right)^{2} \]
\[ = \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{1}{\sqrt{2}} \right)^{(1)} \times \left( \frac{2+2}{\sqrt{2} \times 2} \right)^{(p+2q)} \]
\[ \times \left( \frac{2+3}{\sqrt{2} \times 2} \right)^{(3(2p - 3) + 8q)} \times \left( \frac{3+3}{\sqrt{2} \times 3} \right)^{(3p(5q - 3) - 13q + 7)} \]
\[ = 2025 \left( p + 2q \right) (3 (2p - 3) + 8q) (3p(5q - 3) - 13q + 7). \]
2.2. Multiplicative Shingali and Kanabour Indices for \( Si_2C_3 \). In order to describe the molecular graph of \( Si_2C_3 \), we denote \( p \) as the number of unit cells connected in a row (chain) and \( q \) denotes the number of connected rows, the number of rows per connection. In Figures 3 and 4, we demonstrate how cells are connected in a row (chain) and how a row is connected to another row.

For \( Si_2C_3 \), \( V(Si_2C_3-II[p,q]) = 8pq \) and \( E(Si_2C_3-II[p,q]) = 15pq - 3p - 3q \).

The degree-based edge partition of \( Si_2C_3 \), is given in Table 2.

**Theorem 2.** Let \( Si_2C_3 \) be Silicon Carbides. Then, we have the following:

(1) \( M\chi(Si_2C_3-II[p,q]) = \frac{1}{\sqrt{d_u + d_v}} \prod_{uv \in E(Si_2C_3-II[p,q])} \frac{1}{\sqrt{d_u + d_v}} \left( \sqrt{1+2} \right)^2 \times \left( \sqrt{1+3} \right)^2 \times \left( \sqrt{2+3} \right)^2 \times \left( \sqrt{3+3} \right)^2 \left( 15pq - 13(p + q) + 11 \right) \)

(2) \( MR'(Si_2C_3-II[p,q]) = \frac{1}{\max\{d_u, d_v\}} \prod_{uv \in E(Si_2C_3-II[p,q])} \frac{1}{\max\{d_u, d_v\}} \left( \frac{1}{2} \right)^2 \times \left( \frac{1}{3} \right) \left( \frac{1}{1} \right) \left( 2(p + q) \right) \times \left( \frac{1}{1} \right) \left( 2(4p + 4q - 7) \right) \times \left( \frac{1}{1} \right) \left( 15pq - 13(p + q) + 11 \right) \)

**Table 1:** Partition of \( E(Si_2C_3-I[p,q]) \).

<table>
<thead>
<tr>
<th>((d_u, d_v))</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1, 2)</td>
<td>4</td>
</tr>
<tr>
<td>(1, 3)</td>
<td>1</td>
</tr>
<tr>
<td>(2, 2)</td>
<td>6p + 1 + 8(q - 1)</td>
</tr>
<tr>
<td>(2, 3)</td>
<td>3p (5q - 3) - 13q + 7</td>
</tr>
<tr>
<td>(3, 3)</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 2:** Partition of \( E(Si_2C_3-II[p,q]) \).

<table>
<thead>
<tr>
<th>((d_u, d_v))</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1, 2)</td>
<td>4</td>
</tr>
<tr>
<td>(1, 3)</td>
<td>1</td>
</tr>
<tr>
<td>(2, 2)</td>
<td>2(p + q)</td>
</tr>
<tr>
<td>(2, 3)</td>
<td>2(4p + 4q - 7)</td>
</tr>
<tr>
<td>(3, 3)</td>
<td>15pq - 13(p + q) + 11</td>
</tr>
</tbody>
</table>

Proof
\[ \text{MAG}_1 (\text{Si}_2\text{C}_3 - \text{II}[p, q]) = \sum_{uv \in E (\text{Si}_2\text{C}_3 - \text{II}[p, q])} \frac{d_u + d_v}{2 \sqrt{d_u \times d_v}} \]
\[ = \left( \frac{1 + 2}{2 \sqrt{1 \times 2}} \right)^2 \times \left( \frac{1 + 3}{2 \sqrt{1 \times 3}} \right)(1) \times \left( \frac{2 + 2}{2 \sqrt{2 \times 2}} \right)(2 (p + q)) \]
\[ \times \left( \frac{2 + 3}{2 \sqrt{2 \times 3}} \right)(2 (4p + 4q - 7)) \times \left( \frac{3 + 3}{2 \sqrt{3 \times 3}} \right)(15pq - 13 (p + q) + 11) \]
\[ = 10 (p + q) (4p + 4q - 7) (15pq - 13 (p + q) + 11), \]

\[ \text{MSK} (\text{Si}_2\text{C}_3 - \text{II}[p, q]) = \sum_{uv \in E (\text{Si}_2\text{C}_3 - \text{II}[p, q])} \frac{d_u + d_v}{2} \]
\[ = \left( \frac{1 + 2}{2} \right)^2 \times \left( \frac{1 + 3}{2} \right)(1) \times \left( \frac{2 + 2}{2} \right)(2 (p + q)) \]
\[ \times \left( \frac{2 + 3}{2} \right)(2 (4p + 4q - 7)) \times \left( \frac{3 + 3}{2} \right)(15pq - 13 (p + q) + 11) \]
\[ = 360 (p + q) (4p + 4q - 7) (15pq - 13 (p + q) + 11), \]

\[ \text{MSK}_1 (\text{Si}_2\text{C}_3 - \text{II}[p, q]) = \sum_{uv \in E (\text{Si}_2\text{C}_3 - \text{II}[p, q])} \frac{d_u \times d_v}{2} \]
\[ = \left( \frac{1 \times 2}{2} \right)^2 \times \left( \frac{1 \times 3}{2} \right)(1) \times \left( \frac{2 \times 2}{2} \right)(2 (p + q)) \]
\[ \times \left( \frac{2 \times 3}{2} \right)(2 (4p + 4q - 7)) \times \left( \frac{3 \times 3}{2} \right)(15pq - 13 (p + q) + 11) \]
\[ = 324 (p + q) (4p + 4q - 7) (15pq - 13 (p + q) + 11), \]

\[ \text{MSK}_2 (\text{Si}_2\text{C}_3 - \text{II}[p, q]) = \sum_{uv \in E (\text{Si}_2\text{C}_3 - \text{II}[p, q])} \left( \frac{d_u + d_v}{2} \right)^2 \]
\[ = \left( \frac{1 + 2}{2} \right)^2 \times \left( \frac{1 + 3}{2} \right)(1) \times \left( \frac{2 + 2}{2} \right)^2 (2 (p + q)) \]
\[ \times \left( \frac{2 + 3}{2} \right)^2 (2 (4p + 4q - 7)) \times \left( \frac{3 + 3}{2} \right)^2 (15pq - 13 (p + q) + 11) \]
\[ = 7200 (p + q) (4p + 4q - 7) (15pq - 13 (p + q) + 11). \]

2.3. **Multiplicative Shingali and Kanabour Indices for \text{Si}_2\text{C}_3 - \text{III}[p, q].** The 2D molecular graph of Silicon Carbide \text{Si}_2\text{C}_3 - \text{III} is given in Figures 5 and 6. We can define the molecular graph in this way, where \( p \) represents the unit cell in a row and \( q \) represented the number of connected rows. For \( \text{Si}_2\text{C}_3 - \text{III}[p, q] \), \( V (\text{Si}_2\text{C}_3 - \text{III}[p, q]) = 10pq \) and \( E (\text{Si}_2\text{C}_3 - \text{III}[p, q]) = 15pq - 2p - 3q \).

The degree-based edge partition of \text{Si}_2\text{C}_3 - \text{III} is given in Table 3.

**Theorem 3.** Let \( \text{Si}_2\text{C}_3 - \text{III}[p, q] \) be Silicon Carbides. Then, we have the following:

\( (1) \ M_X (\text{Si}_2\text{C}_3 - \text{III}[p, q]) = (2/15) \sqrt{30} (p + 1) (2 (p + q) - 3) (5p (3q - 2) - 13q + 8) \)
\[
M_X(Si_2C_3 - \text{III}[p, q]) = \prod_{u,v \in E(Si_2C_3 - \text{III}[p, q])} \frac{1}{\sqrt{d_u + d_v}}
\]
\[
= \left( \frac{1}{\sqrt{1 + 3}} \right)^2 \left( \frac{1}{\sqrt{2 + 2}} \right)^{2p + 2}
\]
\[
\times \left( \frac{1}{\sqrt{2 + 3}} \right)^{4(2p + 2q - 3)} \left( \frac{1}{\sqrt{3 + 3}} \right)^{5(p(3q - 2) - 13q + 8)}
\]
\[
= \frac{2}{15} \sqrt{30} (p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8),
\]
\[
MR'(Si_2C_3 - \text{III}[p, q]) = \prod_{u,v \in E(Si_2C_3 - \text{III}[p, q])} \frac{1}{\max[d_u, d_v]}
\]
\[
= \left( \frac{1}{3} \right)^2 \left( \frac{1}{7} \right)^{2p + 2}
\]
\[
\times \left( \frac{1}{3} \right)^{4(2p + 2q - 3)} \left( \frac{1}{3} \right)^{5(p(3q - 2) - 13q + 8)}
\]
\[
= \frac{8}{27} (p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8),
\]

**Proof.**

(2) \( MR'(Si_2C_3 - \text{III}[p, q]) = (8/27)(p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8) \)

(3) \( MAG_1(Si_2C_3 - \text{III}[p, q]) = (40/3)\sqrt{2}(p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8) \)

(4) \( MSK_1(Si_2C_3 - \text{III}[p, q]) = 480(p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8) \)

(5) \( MSK_2(Si_2C_3 - \text{III}[p, q]) = 648(p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8) \)

(6) \( MSK_2(Si_2C_3 - \text{III}[p, q]) = 14400(p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8) \)
\begin{align*}
\text{MAG}_1(\text{Si}_2\text{C}_3 - \text{III}[p, q]) &= \prod_{uv \in E(\text{Si}_2\text{C}_3 - \text{III}[p, q])} \frac{d_u + d_v}{2\sqrt{d_u \times d_v}} \\
&= \left(\frac{1 + 3}{2\sqrt{1 \times 3}}\right)^2 \times \left(\frac{2 + 2}{2\sqrt{2} \times 2}\right)^2 (2p + 2) \\
&\times \left(\frac{2 + 3}{2\sqrt{2} \times 3}\right)^2 (4(2p + 2q - 3)) \times \left(\frac{3 + 3}{2\sqrt{3} \times 3}\right)^2 (5p(3q - 2) - 13q + 8) \\
&= \frac{40}{3}\sqrt{2} (p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8),
\end{align*}

\begin{align*}
\text{MSK}(\text{Si}_2\text{C}_3 - \text{III}[p, q]) &= \prod_{uv \in E(\text{Si}_2\text{C}_3 - \text{III}[p, q])} \frac{d_u + d_v}{2} \\
&= \left(\frac{1 + 3}{2}\right)^2 \times \left(\frac{2 + 2}{2}\right)^2 (2p + 2) \\
&\times \left(\frac{2 + 3}{2}\right)^2 (4(2p + 2q - 3)) \times \left(\frac{3 + 3}{2}\right)^2 (5p(3q - 2) - 13q + 8) \\
&= 480 (p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8),
\end{align*}

\begin{align*}
\text{MSK}_1(\text{Si}_2\text{C}_3 - \text{III}[p, q]) &= \prod_{uv \in E(\text{Si}_2\text{C}_3 - \text{III}[p, q])} \frac{d_u \times d_v}{2} \\
&= \left(\frac{1.3}{2}\right)^2 \times \left(\frac{2.2}{2}\right)^2 (2p + 2) \\
&\times \left(\frac{2.3}{2}\right)^2 (4(2p + 2q - 3)) \times \left(\frac{3.3}{2}\right)^2 (5p(3q - 2) - 13q + 8) \\
&= 648 (p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8),
\end{align*}

\begin{align*}
\text{MSK}_2(\text{Si}_2\text{C}_3 - \text{III}[p, q]) &= \prod_{uv \in E(\text{Si}_2\text{C}_3 - \text{III}[p, q])} \left(\frac{d_u + d_v}{2}\right)^2 \\
&= \left(\frac{1 + 3}{2}\right)^2 \times \left(\frac{2 + 2}{2}\right)^2 (2p + 2) \\
&\times \left(\frac{2 + 3}{2}\right)^2 (4(2p + 2q - 3)) \times \left(\frac{3 + 3}{2}\right)^2 (5p(3q - 2) - 13q + 8) \\
&= 14400 (p + 1)(2(p + q) - 3)(5p(3q - 2) - 13q + 8).
\end{align*}

2.4. Multiplicative Shingali and Kanbour Indices for SiC$_3$ – III[p, q]. Figures 7 and 8 represented the algebraic graphs of Silicon Carbide SiC$_3$ – III[p, q] for different values of p and q, and with the help of these structures, we gave a demonstration of how the cells connect in a row (chain) and how one row connects to another row. For SiC$_3$ – III[p, q], V(SiC$_3$ – III[p, q]) = 8pq and E(SiC$_3$ – III[p, q]) = 12pq – 3p – 2q.

The degree-based edge partition of SiC$_3$ – III is given in Table 4.

**Theorem 4.** Let SiC$_3$ – III[p, q] be Silicon Carbides. Then, we have the following:

1. $M_{X}(\text{SiC}_3 – \text{III}[p, q]) = (2/15)\sqrt{10} (3p + 2q - 3)(3p + 2q - 4)(3pq - 3p - 2q + 2)$
\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
\textbf{\(d_u, d_v\)} & \textbf{Frequency} \\
\hline
(1, 2) & 2 \\
(1, 3) & 1 \\
(2, 2) & 3p + 2q - 3 \\
(2, 3) & 2 (3p + 2q - 4) \\
(3, 3) & 4 (3pq - 3p - 2q + 2) \\
\hline
\end{tabular}
\caption{Partition of \(E(\text{SiC}_3 - \text{III}[p, q])\).}
\end{table}

\begin{proof}
(3) \(MAG_1(\text{SiC}_3 - \text{III}[p, q]) = 20 (3p + 2q - 3)(3p + 2q - 4)(3pq - 3p - 2q + 2)\)

(4) \(MSK(\text{SiC}_3 - \text{III}[p, q]) = 720 (3p + 2q - 3)(3p + 2q - 4)(3pq - 3p - 2q + 2)\)

(5) \(MSK_1(\text{SiC}_3 - \text{III}[p, q]) = 14400 (3p + 2q - 3)(3p + 2q - 4)(3pq - 3p - 2q + 2)\)

(6) \(MSK_2(\text{SiC}_3 - \text{III}[p, q]) = 32400 (3p + 2q - 3)(3p + 2q - 4)(3pq - 3p - 2q + 2)\)

(2) \(MR'(\text{SiC}_3 - \text{III}[p, q]) = (4/27) (3p + 2q - 3)(3p + 2q - 4)(3pq - 3p - 2q + 2)\)

\end{proof}
\[
\prod_{\text{avt.} E(SiC_3-II[p,q])} \frac{d_u + d_v}{2}
\]
\[
\prod_{\text{avt.} E(SiC_3-III[p,q])} \frac{d_u \times d_v}{2}
\]
\[
\sum_{\text{avt.} E(SiC_3-III[p,q])} \left(\frac{d_u + d_v}{2}\right)^2
\]

\[
3. \text{Conclusion}
\]
In this paper, we have introduced some new multiplicative degree-based indices. We also computed the newly introduced indices for Silicone Carbides \(Si_iC_j - I[p,q], Si_iC_j - II[p,q], Si_iC_j - III[p,q],\) and \(Si_iC_j - III[p,q].\) Our results are applicable in chemistry, physics, and other applied sciences.

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4. \text{Future Directions}
\]
To compute distance-based indices and polynomials of understudy Silicone Carbides is an interesting problem for the researchers.

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\text{Data Availability}
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The data used to support the findings of this study are included within the article.

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\text{Conflicts of Interest}
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The authors declare that they have no conflicts of interest.

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\text{Authors’ Contributions}
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All authors have an equal contribution.

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References


