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# Some K-Banhatti Polynomials of First Dominating David Derived Networks

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**Abstract:**

Chemical compounds, characteristics, and molecular structures are inevitably connected. Topological indices are numerical values connected with chemical molecular graphs that contribute to understanding a chemical compounds physical qualities, chemical reactivity, and biological activity. In this study, we have obtained some topological properties of the first dominating David derived (**DDD**) networks and computed several K-Banhatti polynomials of the first type of DDD.

**Keywords:** Dominating David Derived networks, $\boldsymbol{F-K}$ Banhatti indices, harmonic K Banhatti indices, K-Banhatti polynomial, K-hyper Banhatti indices, symmetric division K Banhatti indices.

## Introduction:

Suppose that $G=(V,E)$ is a finite, simple, connected graph [1,2]. A chemical compound is represented by a simple graph called a molecular graph in chemical graph theory, which is a branch of graph theory, with the vertices representing the complex atoms and the edges representing the atomic bonds. If a graph contains at least one connection between its vertices, it is referred to be connected. A network is a graph with no loops or multiple edges. More information can be found in book [3]. Another emerging field is chem-informatics, which improves the predictions of biological activities using the structure property and quantitative structure-activity relationships. If emphasized chemicals are used in these studies, topological indices and physicochemical properties are used to predict bioactivity [4,5]. A topological index is a number that describes a topological graph. This index was studied by both Mathematicians and chemists [6]. Discusses how to construct [7] an $m$ dimensional David derived and DDD.

In [8] V. R. Kulli introduced the I[st] & II[nd] K Banhatti indices,

$B_1(G)=\sum_{ue}|E_{ue}|[d_G(u)+d_G(e)]$ $\quad B_2(G)=\sum_{ue}|E_{ue}|[d_G(u)*d_G(e)]$

The Ist & II[nd] K Banhatti Polynomials are defined as follows using K Banhatti indices:

$$B_1(G,x,y)=\sum_{\substack{ue\\ d(u)\le d(v)}}|E_{ue}|\; x^{[d_G(u)+d_G(e)]}\; y^{[d_G(v)+d_G(e)]}$$

$$B_2(G,x,y)=\sum_{\substack{ue\\ d(u)\le d(v)}}|E_{ue}|\; x^{[d_G(u)*d_G(e)]}\; y^{[d_G(v)*d_G(e)]}$$

The Ist & II[nd] K hyper Banhatti indices [9] are defined as

$$HB_1(G)=\sum_{ue}|E_{ue}|\;[d_G(u)+d_G(e)]^2$$

$$HB_2(G)=\sum_{ue}|E_{ue}|[d_G(u)*d_G(e)]^2$$

The Ist & II[nd] Banhatti polynomials of a graph can be calculated using the K hyper Banhatti indices as follows:

$$HB_1(G,x,y)=\sum_{\substack{ue\\ d(u)\le d(v)}}|E_{ue}|\; x^{[d_G(u)+d_G(e)]^2}\; y^{[d_G(v)+d_G(e)]^2}$$

$$HB_2(G,x,y)=\sum_{\substack{ue\\ d(u)\le d(v)}}|E_{ue}|x^{[d_G(u)*d_G(e)]^2}\; y^{[d_G(v)*d_G(e)]^2}$$

In [10], V. R. Kulli introduced the modified first and second Banhatti indices,

$$^{M}B_1(G)=\sum_{ue}|E_{ue}|\;\frac{1}{d_G(u)+d_G(e)}$$

$$^{M}B_2(G)=\sum_{ue}|E_{ue}|\;\frac{1}{d_G(u)*d_G(e)}$$

The modified I[st] & II[nd] K Banhatti polynomials are defined as follows:

$$^{M}B_1(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\frac{1}{d_G(u)+d_G(e)}}\, y^{\frac{1}{d_G(v)+d_G(e)}}$$

$$^{M}B_2(G) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\frac{1}{d_G(u)*d_G(e)}}\, y^{\frac{1}{d_G(v)*d_G(e)}}$$

The sum and product connectivity Banhatti indices [11] are calculated using the following formulas:

$$SB(G) = \sum_{ue} |E_{ue}|\, \frac{1}{\sqrt{d_G(u)+d_G(e)}}$$

$$PB(G) = \sum_{ue} |E_{ue}|\, \frac{1}{\sqrt{d_G(u)*d_G(e)}}$$

The sum and product connectivity Banhatti polynomials of $G$ are defined as:

$$SB(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\frac{1}{\sqrt{d_G(u)+d_G(e)}}}\, y^{\frac{1}{\sqrt{d_G(v)+d_G(e)}}}$$

$$PB(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\frac{1}{\sqrt{d_G(u)*d_G(e)}}}\, y^{\frac{1}{\sqrt{d_G(v)*d_G(e)}}}$$

The graph $G$ is generally first and second K Banhatti indices [12] as:

$$B_1^a(G) = \sum_{ue} |E_{ue}|[d_G(u)+d_G(e)]^a$$

$$B_2^a(G) = \sum_{ue} |E_{ue}|[d_G(u)*d_G(e)]^a$$

The general I[st] & II[nd] K Banhatti polynomials of a graph $G$ using general first and second K Banhatti indices as:

$$B_1^a(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{[d_G(u)+d_G(e)]^a}\, y^{[d_G(v)+d_G(e)]^a}$$

$$B_2^a(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{[d_G(u)*d_G(e)]^a}\, y^{[d_G(v)*d_G(e)]^a}$$

where $a$ is a real number.

The $F-K$ Banhatti index of $G$ is defined as follows:

$$FB(G) = \sum_{ue} |E_{ue}|\, [d_G(u)^2 + d_G(e)^2]$$

Using the $F-K$ Banhatti index, we define the $F-K$ Banhatti polynomial of $G$, as:

$$FB(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{[d_G(u)^2+d_G(e)^2]}\, y^{[d_G(v)^2+d_G(e)^2]}$$

A graph $G$ is harmonic K Banhatti index [13] is defined as:

$$H_b(G) = \sum_{ue} |E_{ue}|\, \frac{2}{d_G(u)+d_G(e)}$$

The harmonic K Banhatti polynomial of a graph $G$ is defined as:

$$H_b(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\frac{2}{d_G(u)+d_G(e)}}\, y^{\frac{2}{d_G(v)+d_G(e)}}$$

The symmetric division K Banhatti index [13] of $G$ is defined as:

$$SDB(G) = \sum_{ue} |E_{ue}|\, \left[\frac{d_G(u)}{d_G(e)} + \frac{d_G(e)}{d_G(u)}\right]$$

The symmetric division K Banhatti polynomial of $G$ is defined as:

$$SDB(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\left[\frac{d_G(u)}{d_G(e)}+\frac{d_G(e)}{d_G(u)}\right]}\, y^{\left[\frac{d_G(v)}{d_G(e)}+\frac{d_G(e)}{d_G(v)}\right]}$$

The inverse sum index K Banhatti index [14] of a graph $G$ as

$$ISB(G) = \sum_{ue} |E_{ue}|\, \left[\frac{d_G(u)d_G(e)}{d_G(u)+d_G(e)}\right]$$

The inverse sum K Banhatti polynomial of a graph $G$ as:

$$ISB(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} |E_{ue}|\, x^{\left[\frac{d_G(u)d_G(e)}{d_G(u)+d_G(e)}\right]}\, y^{\left[\frac{d_G(v)d_G(e)}{d_G(v)+d_G(e)}\right]}$$

## Result and Discussion

In this section, the topological properties of the first dominating David derived (**DDD**) Networks are determined, and several K-Banhatti polynomials of the first type of DDD have been computed (as shown in Fig.1).

**First type of DDD Network**

Consider the $m$ dimensional David's star network. Add a new vertex to each edge and divide it into two parts. The David-derived network $DD(m)$of dimension $m$ will be obtained.

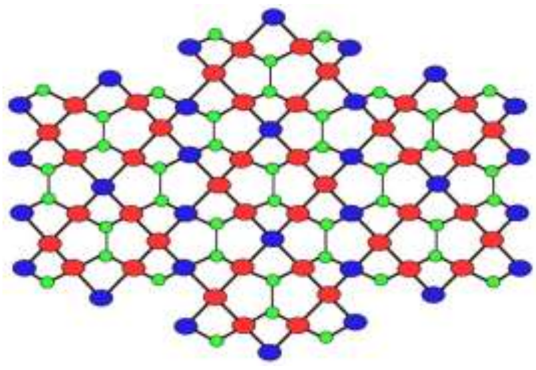

**Figure 1. Domination David Derived network of the first type**

$D_1(m)$, obtains the DDD network of the first type of dimension $m$ by connecting vertices of degree 2 of $DDD(m)$ with an edge that is not in the boundary.

The edge set of $G$ in $G = D_1(m)$ can be divided into six partitions based on the degree of end vertices of each edge, as shown in Table 1.

**Table 1. Edge degree partition of $G$**

| $d_G(u), d_G(v)$; $e = uv \in E(G)$ | (2,2) | (2,3) | (2,4) | (3,3) | (3,4) | (4,4) |
|---|---|---|---|---|---|---|
| No of edges | $4m$ | $4m-4$ | $28m-16$ | $9m^2-13m+24$ | $36m^2-56m+24$ | $36m^2-56m+20$ |
| $d_G(e) = d_G(u) + d_G(v) - 2$ | 2 | 3 | 4 | 4 | 5 | 6 |

Compute the generalized first K Banhatti polynomial of a DDD network using the following theorem.

**Theorem 1:**
If $G = D_1(n)$ is the DDD network, then

$$B_1^a(G,x,y) = 4m\, x^{4^a} y^{4^a} + (4m-4)\, x^{5^a} y^{6^a} + (28m-16)\, x^{6^a} y^{8^a} + (9m^2-13m+24)\, x^{7^a} y^{7^a} + (36m^2-56m+24)\, x^{8^a} y^{9^a} + (36m^2-56m+20)\, x^{10^a} y^{10^a}$$

**Proof**: In aforesaid Table 1.

$$B_1^a(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} E_{ue}\, x^{[d_G(u)+d_G(e)]^a} y^{[d_G(v)+d_G(e)]^a}$$

$$= 4m\, x^{(2+2)^a} y^{(2+2)^a} + (4m-4)\, x^{(2+3)^a} y^{(3+3)^a} + (28m-16) x^{(2+4)^a} y^{(4+4)^a} + (9m^2-13m+24)\, x^{(3+4)^a} y^{(3+4)^a} + (36m^2-56m+24) x^{(3+5)^a} y^{(4+5)^a} + (36m^2-56m+20) x^{(4+6)^a} y^{(4+6)^a}$$

$$= 4m\, x^{(4)^a} y^{(4)^a} + (4m-4)\, x^{(5)^a} y^{(6)^a} + (28m-16) x^{(6)^a} y^{(8)^a} + (9m^2-13m+24) x^{(7)^a} y^{(7)^a} + (36m^2-56m+24) x^{(8)^a} y^{(9)^a} + (36m^2-56m+20) x^{(10)^a} y^{(10)^a}$$

The following are the results of Theorem 1.

**Result 1:**
The first K Banhatti polynomial $D_1(m)$ is (as shown in Fig.2)

$$B_1(G,x,y) = 4m\, x^4 y^4 + (4m-4)\, x^5 y^6 + (28m-16)\, x^6 y^8 + (9m^2-13m+24)\, x^7 y^7 + (36m^2-56m+24)\, x^8 y^9 + (36m^2-56m+20)\, x^{10} y^{10}$$

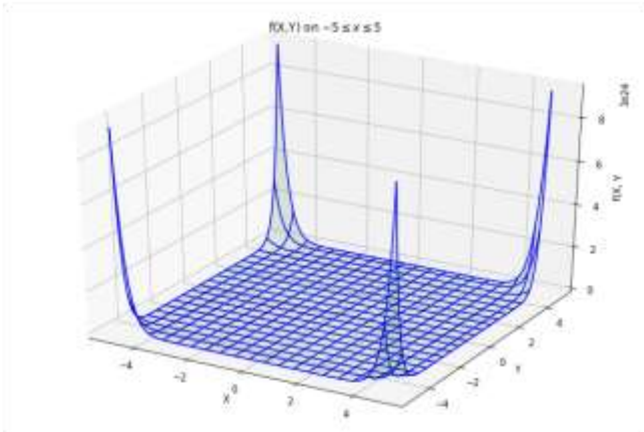

**Figure 2. The first K Banhatti polynomial of Domination David Derived Network**

**Result 2:**
The first hyper K Banhatti polynomial $D_1(m)$ is (as shown in Fig.3)

$$HB_1(G,x,y) = 4m\, x^{16} y^{16} + (4m-4)\, x^{25} y^{36} + (28m-16)\, x^{36} y^{64} + (9m^2-13m+24) x^{49} y^{49} + (36m^2-56m+24)\, x^{64} y^{81} + (36m^2-56m+20)\, x^{100} y^{100}$$

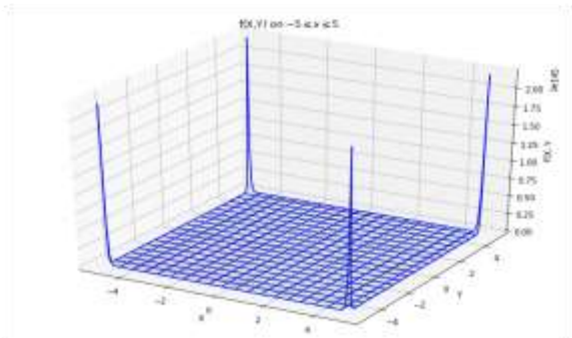

**Figure 3. The first hyper K Banhatti polynomial of Domination David Derived Network**

**Result 3:**
The Modified K Banhatti polynomial $D_1(m)$ is (as shown in Fig.4)

$$ {}^{M}B_1(G,x,y) = 4m\, x^{\frac{1}{4}}\, y^{\frac{1}{4}} + (4m-4)\, x^{\frac{1}{5}}\, y^{\frac{1}{6}} + (28m-16)x^{\frac{1}{6}}\, y^{\frac{1}{8}} + (9m^2-13m+24)x^{\frac{1}{7}}\, y^{\frac{1}{7}} + (36m^2-56m+24)x^{\frac{1}{8}}\, y^{\frac{1}{9}} + (36m^2-56m+20)x^{\frac{1}{10}}\, y^{\frac{1}{10}} $$

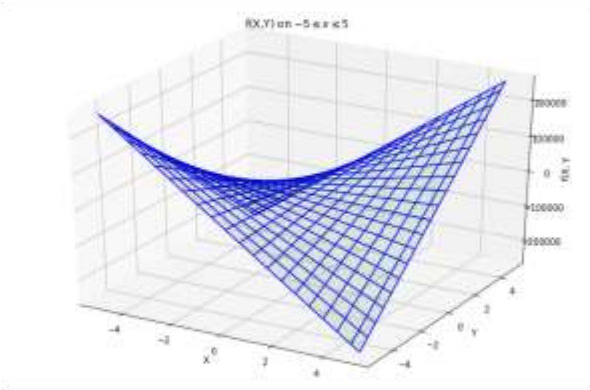

**Figure 4. The First modified K Banhatti polynomial of Domination David Derived Network**

**Result 4:**

The K Banhatti polynomial sum connectivity $D_1(m)$ is (as shown in Fig.5)

$$ SB(G,x,y) = 4m\, x^{\frac{1}{2}}\, y^{\frac{1}{2}} + (4m-4)\, x^{\frac{1}{\sqrt{5}}}\, y^{\frac{1}{\sqrt{6}}} + (28m-16)x^{\frac{1}{\sqrt{6}}}\, y^{\frac{1}{\sqrt{8}}} + (9m^2-13m+24)x^{\frac{1}{\sqrt{7}}}\, y^{\frac{1}{\sqrt{7}}} + (36m^2-56m+24)x^{\frac{1}{\sqrt{8}}}\, y^{\frac{1}{3}} + (36m^2-56m+20)x^{\frac{1}{\sqrt{10}}}\, y^{\frac{1}{\sqrt{10}}} $$

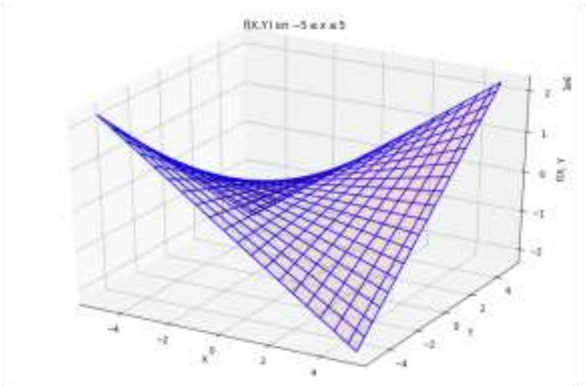

**Figure 5. The First sum connectivity K Banhatti polynomial of Domination David Derived Network**

**Theorem 2:**

If $G$ is the DDD network, then

$$ B_2^{a}(G,x,y) = 4m\, x^{(4)^a}\, y^{(4)^a} + (4m-4)\, x^{(6)^a}\, y^{(9)^a} + (28m-16)x^{(8)^a}\, y^{(16)^a} + (9m^2-13m+24)\, x^{(12)^a}\, y^{(12)^a} + (36m^2-56m+24)x^{(15)^a}\, y^{(20)^a} + (36m^2-56m+20)x^{(24)^a}\, y^{(24)^a} $$

**Proof:** In aforesaid Table 1.

$$ B_2^{a}(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} E_{ue}\, x^{[d_G(u)*d_G(e)]^a}\, y^{[d_G(v)*d_G(e)]^a} $$

$$ = 4m\, x^{(2*2)^a}\, y^{(2*2)^a} + (4m-4)\, x^{(2*3)^a}\, y^{(3*3)^a} + (28m-16)x^{(2*4)^a}\, y^{(4*4)^a} + (9m^2-13m+24)x^{(3*4)^a}\, y^{(3*4)^a} + (36m^2-56m+24)x^{(3*5)^a}\, y^{(4*5)^a} + (36m^2-56m+20)x^{(4*6)^a}\, y^{(4*6)^a} $$

$$ = 4m\, x^{(4)^a}\, y^{(4)^a} + (4m-4)\, x^{(6)^a}\, y^{(9)^a} + (28m-16)x^{(8)^a}\, y^{(16)^a} + (9m^2-13m+24)\, x^{(12)^a}\, y^{(12)^a} + (36m^2-56m+24)x^{(15)^a}\, y^{(20)^a} + (36m^2-56m+20)x^{(24)^a}\, y^{(24)^a} $$

The following are the results of Theorem 2.

**Result 5:**

The second K Banhatti polynomial $D_1(m)$ is (as shown in Fig.6)

$$ B_2(G,x,y) = 4m\, x^4\, y^4 + (4m-4)\, x^6\, y^9 + (28m-16)\, x^8\, y^{16} + (9m^2-13m+24)\, x^{12}\, y^{12} + (36m^2-56m+24)\, x^{15}\, y^{20} + (36m^2-56m+20)\, x^{24}\, y^{24} $$

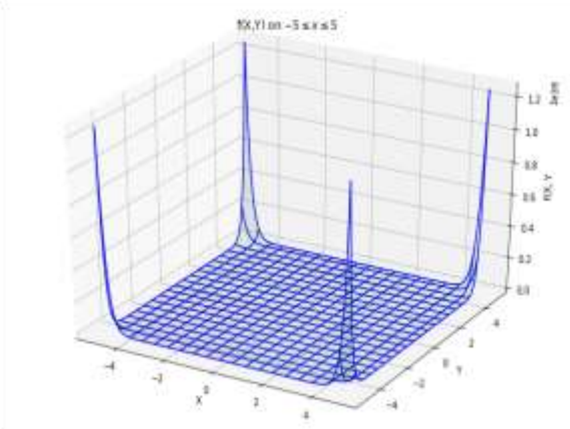

**Figure 6. The second K Banhatti polynomial of Domination David Derived Network**

**Result 6:**

The second hyper K Banhatti polynomial $D_1(m)$ is (as shown in Fig.7)

$$ HB_2(G,x,y) = 4m\, x^{16}\, y^{16} + (4m-4)\, x^{36}\, y^{81} + (28m-16)\, x^{64}\, y^{256} + (9m^2-13m+24)\, x^{144}\, y^{144} + (36m^2-56m+24)\, x^{225}\, y^{400} + (36m^2-56m+20)\, x^{576}\, y^{576} $$

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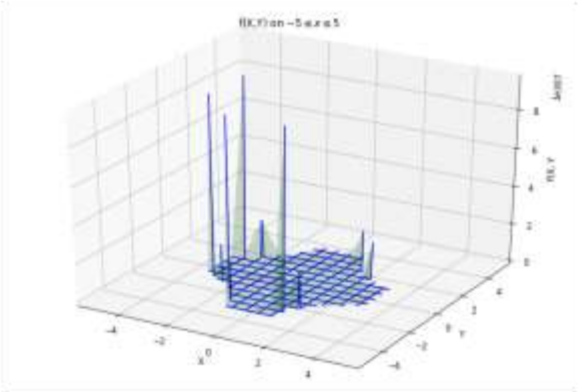

**Figure 7. The second hyper K Banhatti polynomial of Domination David Derived Network**

**Result 7:**

The modified K Banhatti polynomial $D_1(m)$ is (as shown in Fig.8)

$$^{M}B_2(G,x,y) = 4m\,x^{\frac{1}{4}}\,y^{\frac{1}{4}} + (4m-4)\,x^{\frac{1}{6}}\,y^{\frac{1}{9}} + (28m-16)x^{\frac{1}{8}}\,y^{\frac{1}{16}} + (9m^2-13m+24)x^{\frac{1}{12}}\,y^{\frac{1}{12}} + (36m^2-56m+24)x^{\frac{1}{15}}\,y^{\frac{1}{20}} + (36m^2-56m+20)x^{\frac{1}{24}}\,y^{\frac{1}{24}}$$

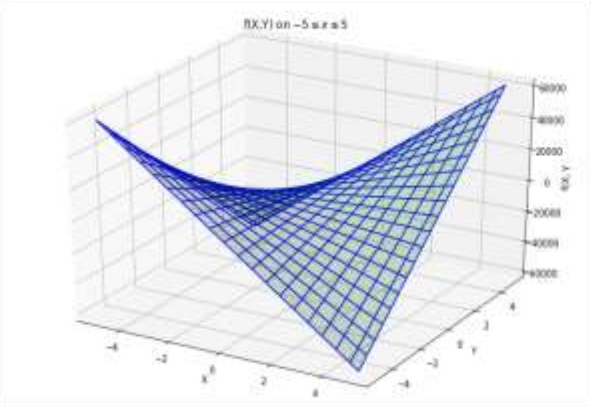

**Figure 8. The modified K Banhatti polynomial of Domination David Derived Network**

**Result 8:**

The Product connectivity K Banhatti polynomial $D_1(m)$ is (as shown in Fig.9)

$$P\,B(G,x,y) = 4m\,x^{\frac{1}{2}}\,y^{\frac{1}{2}} + (4m-4)\,x^{\frac{1}{\sqrt{6}}}\,y^{\frac{1}{3}} + (28m-16)x^{\frac{1}{\sqrt{8}}}\,y^{\frac{1}{4}} + (9m^2-13m+24)x^{\frac{1}{\sqrt{12}}}\,y^{\frac{1}{\sqrt{12}}} + (36m^2-56m+24)x^{\frac{1}{\sqrt{15}}}\,y^{\frac{1}{\sqrt{20}}} + (36m^2-56m+20)x^{\frac{1}{\sqrt{24}}}\,y^{\frac{1}{\sqrt{24}}}$$

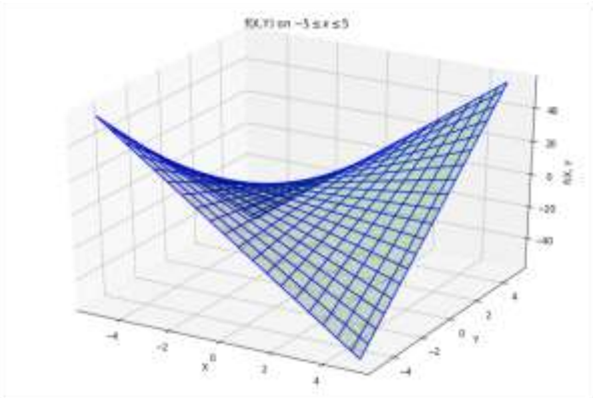

**Figure 9. The Product connectivity K Banhatti polynomial Domination David Derived Network**

**Theorem 3:**

Let $G = D_1(m)$ is the DDD network, then

$$FB(G,x,y) = 4m\,x^8\,y^8 + (4m-4)\,x^{13}\,y^{18} + (28m-16)x^{20}\,y^{32} + (9m^2-13m+24)x^{25}\,y^{25} + (36m^2-56m+24)x^{34}\,y^{41} + (36m^2-56m+20)x^{52}\,y^{52}$$

**Proof:** Using Table 1.

$$FB(G,x,y) = \sum_{\substack{ue \\ d(u)\le d(v)}} E_{ue}\,x^{d_G(u)^2+d_G(e)^2}\,y^{d_G(v)^2+d_G(e)^2}$$

$$= 4m\,x^{2^2+2^2}\,y^{2^2+2^2} + (4m-4)\,x^{2^2+3^2}\,y^{3^2+3^2} + (28m-16)x^{2^2+4^2}\,y^{4^2+4^2} + (9m^2-13m+24)\,x^{3^2+4^2}\,y^{3^2+4^2} + (36m^2-56m+24)x^{3^2+5^2}\,y^{4^2+5^2} + (36m^2-56m+20)x^{4^2+6^2}\,y^{4^2+6^2}$$

$$= 4m\,x^8\,y^8 + (4m-4)\,x^{13}\,y^{18} + (28m-16)x^{20}\,y^{32} + (9m^2-13m+24)x^{25}\,y^{25} + (36m^2-56m+24)x^{34}\,y^{41} + (36m^2-56m+20)x^{52}\,y^{52}$$

(as shown in Fig.10).

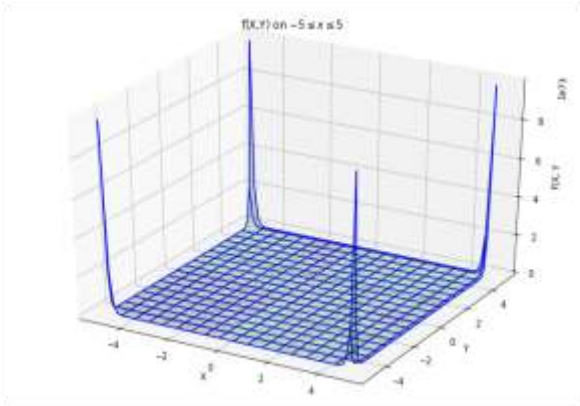

**Figure 10: The F-K Banhatti polynomial Domination David Derived Network**

**Theorem 4:**

Let $G = D_1(m)$ is the DDD network, then:

$$H_b(G,x,y) = 4mx^{\frac{1}{2}}y^{\frac{1}{2}} + (4m-4)\,x^{\frac{2}{5}}y^{\frac{1}{3}} + (28m-16)x^{\frac{1}{3}}y^{\frac{1}{4}} + (9m^2-13m+24)\,x^{\frac{2}{7}}y^{\frac{2}{7}} + (36m^2-56m+24)x^{\frac{1}{4}}y^{\frac{2}{9}} + (36m^2-56m+20)x^{\frac{1}{5}}y^{\frac{1}{5}}$$

**Proof:** In aforesaid Table 1.

$$H_b(G,x,y) = \sum_{\substack{ue\\ d(u)\le d(v)}} E_{ue}\, x^{\frac{2}{d_G(u)+d_G(e)}}\, y^{\frac{2}{d_G(v)+d_G(e)}}$$

$$= 4m\,x^{\frac{2}{2+2}}y^{\frac{2}{2+2}} + (4m-4)\,x^{\frac{2}{2+3}}y^{\frac{2}{3+3}} + (28m-16)x^{\frac{2}{2+4}}y^{\frac{2}{4+4}} + (9m^2-13m+24)x^{\frac{2}{3+4}}y^{\frac{2}{3+4}} + (36m^2-56m+24)x^{\frac{2}{3+5}}y^{\frac{2}{4+5}} + (36m^2-56m+20)x^{\frac{2}{4+6}}y^{\frac{2}{4+6}}$$

$$= 4m\,x^{\frac{1}{2}}y^{\frac{1}{2}} + (4m-4)\,x^{\frac{2}{5}}y^{\frac{1}{3}} + (28m-16)x^{\frac{1}{3}}y^{\frac{1}{4}} + (9m^2-13m+24)\,x^{\frac{2}{7}}y^{\frac{2}{7}} + (36m^2-56m+24)x^{\frac{1}{4}}y^{\frac{2}{9}} + (36m^2-56m+20)x^{\frac{1}{5}}y^{\frac{1}{5}}$$ (as shown in Fig.11)

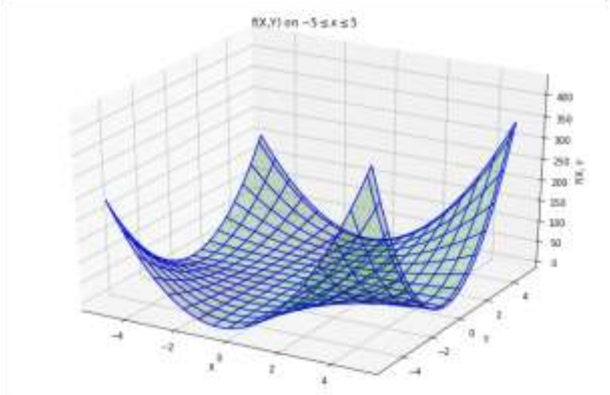

**Figure 11. The Harmonic K Banhatti polynomial Domination David Derived Network**

**Theorem 5:**

Let $G = D_1(m)$ is the DDD network, then:

$$SDB(G,x,y) = 4m\,x^2y^2 + (4m-4)\,x^{\frac{13}{6}}y^2 + (28m-16)x^{\frac{5}{2}}y^2 + (9m^2-13m+24)x^{\frac{25}{12}}y^{\frac{25}{12}} + (36m^2-56m+24)x^{\frac{34}{15}}y^{\frac{41}{20}} + (36m^2-56m+20)x^{\frac{52}{24}}y^{\frac{52}{24}}$$

Proof: In aforesaid Table 1.

$$SDB(G,x,y) = \sum_{\substack{ue\\ d(u)\le d(v)}} E_{ue}\, x^{\frac{d_G(u)}{d_G(e)}+\frac{d_G(e)}{d_G(u)}}\, y^{\frac{d_G(v)}{d_G(e)}+\frac{d_G(e)}{d_G(v)}}$$

$$= 4m\,x^{\frac{2}{2}+\frac{2}{2}}y^{\frac{2}{2}+\frac{2}{2}} + (4m-4)\,x^{\frac{2}{3}+\frac{3}{2}}y^{\frac{3}{3}+\frac{3}{3}} + (28m-16)x^{\frac{2}{4}+\frac{4}{2}}y^{\frac{4}{4}+\frac{4}{4}} + (9m^2-13m+24)x^{\frac{3}{4}+\frac{4}{3}}y^{\frac{3}{4}+\frac{4}{3}} + (36m^2-56m+24)x^{\frac{3}{5}+\frac{5}{3}}y^{\frac{4}{5}+\frac{5}{4}} + (36m^2-56m+20)x^{\frac{4}{6}+\frac{6}{4}}y^{\frac{4}{6}+\frac{6}{4}}$$

$$= 4m\,x^2y^2 + (4m-4)\,x^{\frac{13}{6}}y^2 + (28m-16)x^{\frac{5}{2}}y^2 + (9m^2-13m+24)\,x^{\frac{25}{12}}y^{\frac{25}{12}} + (36m^2-56m+24)x^{\frac{34}{15}}y^{\frac{41}{20}} + (36m^2-56m+20)x^{\frac{52}{24}}y^{\frac{52}{24}}$$ (as shown in Fig.12)

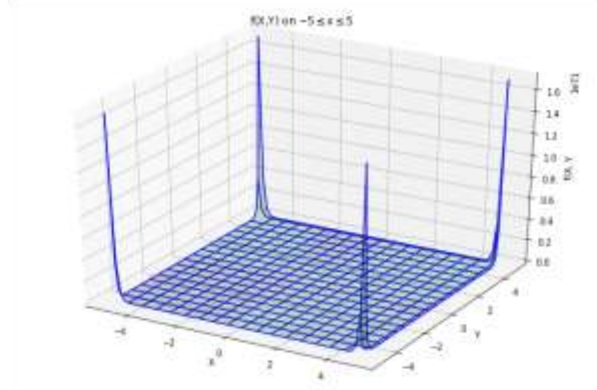

**Figure 12. The symmetric division K Banhatti polynomial Domination David Derived Network**

**Theorem 6:**

Let $G = D_1(m)$ is the DDD network, then:

$$ISB(G,x,y) = 4m\,x\,y + (4m-4)\,x^{\frac{6}{5}}y^{\frac{3}{2}} + (28m-16)x^{\frac{4}{3}}y^2 + (9m^2-13m+24)x^{\frac{12}{7}}y^{\frac{12}{7}} + (36m^2-56m+24)x^{\frac{15}{8}}y^{\frac{20}{9}} + (36m^2-56m+20)x^{\frac{12}{5}}y^{\frac{12}{5}}$$

**Proof:** Using Table 1. and definition.

$$ISB(G,x,y) = \sum_{\substack{ue\\ d(u)\le d(v)}} E_{ue}\, x^{\frac{d_G(u)*d_G(e)}{d_G(e)+d_G(u)}}\, y^{\frac{d_G(v)*d_G(e)}{d_G(e)+d_G(v)}}$$

$$= 4m\,x^{\frac{2*2}{2+2}}y^{\frac{2*2}{2+2}} + (4m-4)\,x^{\frac{2*3}{2+3}}y^{\frac{3*3}{3+3}} + (28m-16)x^{\frac{2*4}{2+4}}y^{\frac{4*4}{4+4}} + (9m^2-13m+24)\,x^{\frac{3*4}{3+4}}y^{\frac{3*4}{3+4}} + (36m^2-56m+24)x^{\frac{3*5}{3+5}}y^{\frac{4*5}{4+5}} + (36m^2-56m+20)x^{\frac{4*6}{4+6}}y^{\frac{4*6}{4+6}}$$

$$= 4m\,x\,y + (4m-4)\,x^{\frac{6}{5}}y^{\frac{3}{2}} + (28m-16)x^{\frac{4}{3}}y^2 + (9m^2-13m+24)x^{\frac{12}{7}}y^{\frac{12}{7}}$$

$$+ (36m^2 - 56m + 24)x^{\frac{15}{8}} y^{\frac{20}{9}} + (36m^2 - 56m + 20)x^{\frac{12}{5}} y^{\frac{12}{5}}.$$ (as shown in Fig.13)

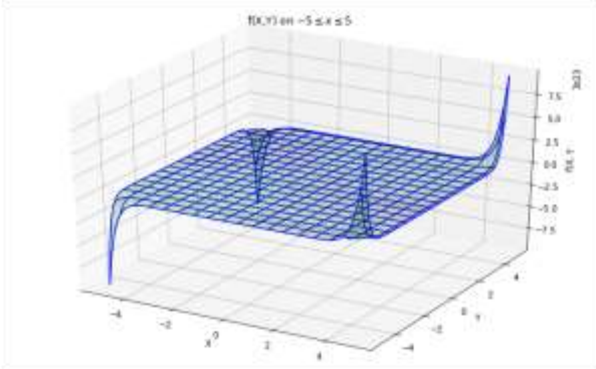

**Figure 13. The inverse sum index K Banhatti polynomial Domination David Derived Network**

## Conclusion:

In this paper, the K-Banhatti Polynomials of the first type of David Derived Networks have extended and computed the first type of DDD network through topological indices. We plot the results in K-Banhatti indices and several K-Banhatti polynomials and their respective 3-D graphs.

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## Authors' declaration:

- Conflicts of Interest: None.
- We hereby confirm that all the Figures and Tables in the manuscript are mine ours. Besides, the Figures and images, which are not mine ours, have been given the permission for re-publication attached with the manuscript.
- Ethical Clearance: The project was approved by the local ethical committee in Guru Nanak Institutions Technical Campus (Autonomous).

## Authors' contribution statement:

Anjaneyulu Mekala; Conception, Design, Acquisition of data, Analysis, Drafting the MS, Interpreting the results, and Design the figures U Vijaya Chandra Kumar, R Murali; Interpretation, Revision, and proofreading. All the authors discussed the results and commented on the manuscript.

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# بعض متعددات حدود بانهتي لشبكات مشتقة ديفيد الأولى المهيمنة

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**الخلاصة:**
ترتبط المركبات الكيميائية والخصائص والتراكيب الجزيئية إرتباطا حتمياً. إن المؤشرات التبولوجية هي عبارة عن قيم عددية مرتبطة بالرسوم البيانية الجزيئية الكيميائية التي تساهم في فهم الصفات الفيزيائية للمركب الكيميائي والتفاعل الكيميائي والنشاط البيولوجي. في هذه الدراسة، تم الحصول على بعض الخواص التبولوجية لشبكات مشتقة ديفيد الأولى المهيمنة, وحساب العديد من ممتعددات حدود K- Banhatti من النوع الأول من شبكات مشتقة ديفيد الأولى المهيمنة.

**الكلمات المفتاحية:** شبكات مشتقة ديفيد الأولى المهيمنة، مؤشرات اف-كي بنهاتي، مؤشرات كي - بنهاتي التوافقية، متعددة الحدود كي – بانهتي، مؤشرات كي هايبر بنهاتي، مؤشرات القسمة متماثلة كي بنهاتي