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Augmented Zagreb Index of Corona Product of Some Special Graphs

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***Abstract:** Let $G(V,E)$ be a simple undirected graph. The Augmented Zagreb Index of a graph G is defined as $AZI(G)=\sum_{uv\in E(G)}\left(\frac{du\cdot dv}{du+dv-2}\right)^3$, Where du is the degree of the vertex u in G. In this paper, the exact expression for Augmented Zagreb Index of different product of graphs like Comb, Wheel, Fan,andSun graph.*

***Keywords:** Corona product, Augmented Zagreb index.*

I. INTRODUCTION

A graph G is defined as a pair $G=(V,E)$, where V is a non-empty set of vertices and E is a set of edges. In this paper graphs are simple and connected. We will deal with finite graph,i.e., both $|V|$ and $|E|$ are finite sets. If G is defined as the Augmented Zagreb index $AZI(G)=\sum_{uv\in E(G)}\left(\frac{du\cdot dv}{du+dv-2}\right)^3$ of a connected graph.Augmented Zagreb index of corona product is expanded the result of Zagreb index of corona product [9,11].This research can be expanded to include domination of results and theorems have been verified by the Inverse sum indeg index[1,4,5,6,10,12,13,14]Some definitions and results are cited as follows [2,3,7,8,16]. This work can also be expanded upon in the context of automata theory [17,18,19] which has a numerous applications. There are numerous application for graph labeling in both undirected [15,21,22,26,27] and directed graphs [20,23,24,25].

II. MAIN RESULT

Definition 2.1

The Augmented Zagreb index $AZI(G)$ of a connected graph G is defined as $AZI(G)=\sum_{uv\in E(G)}\left(\frac{du\cdot dv}{du+dv-2}\right)^3$, where u and v are the degrees of the end-vertices of an edge uv, respectively.

Theorem 2.1

Let G_1 and G_2 be two simple connected graphs then the Augmented Zagreb index of corona product of P_n and K_1 is

$$\frac{216mn+1026m+729n-3581}{64}$$

Proof:

The structure of Corona product of P_n and K_1 is shown in fig.2.1 the graph $P_n\circ K_1$ has $n(m+1)$ vertices and $nm+n-1$ edges.

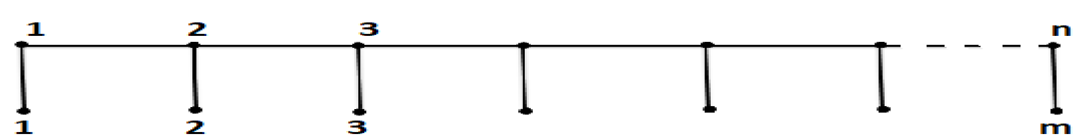

Fig 2.1: Comb $P_n\circ K_1$

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Cleary, $P_n \circ K_1$ there are $(1,2)-$ edges, $(1,3)-$ edges, $(2,3)-$ edges, $(3,3)-$ edges, also

$$x_{1,2}=2, \quad x_{1,3}=m(n-2), \quad x_{2,3}=2, \quad x_{3,3}=2m+n-5$$

$$AZI(P_n \circ K_1)=2\left(\frac{1\cdot 2}{1+2-2}\right)^3+m(n-2)\left(\frac{1\cdot 3}{1+3-2}\right)^3+2\left(\frac{2\cdot 3}{2+3-2}\right)^3+2m+n-5\left(\frac{3\cdot 3}{3+3-2}\right)^3$$

$$=2(2)^3+mn-2m\left(\frac{3}{2}\right)^3+2(2)^3+2m+n-5\left(\frac{9}{4}\right)^3$$

$$=16+mn-2m\left(\frac{27}{8}\right)+16+2m+n-5\left(\frac{729}{64}\right)$$

$$=32+\frac{216mn-432m+1458m+729n-3645}{64}$$

$$=\frac{64+216mn+1026m+729n-3645}{64}$$

$$=\frac{216mn+1026m+729-3581}{64}$$

Theorem 2.2

Let G_1 and G_2 be two simple connected graphs then the Augmented Zagreb index of corona product of K_1 and C_m is

$$\frac{2457m^4n+2187m^3n+2187m^2n+729mn}{64m^3+192m^2+192m+64}$$

Proof:

The structure of corona product of K_1 and C_m is shown in fig.2.2The graph $K_1 \circ C_m$ has $n(m+1)$ vertices and $2nm$ edges.

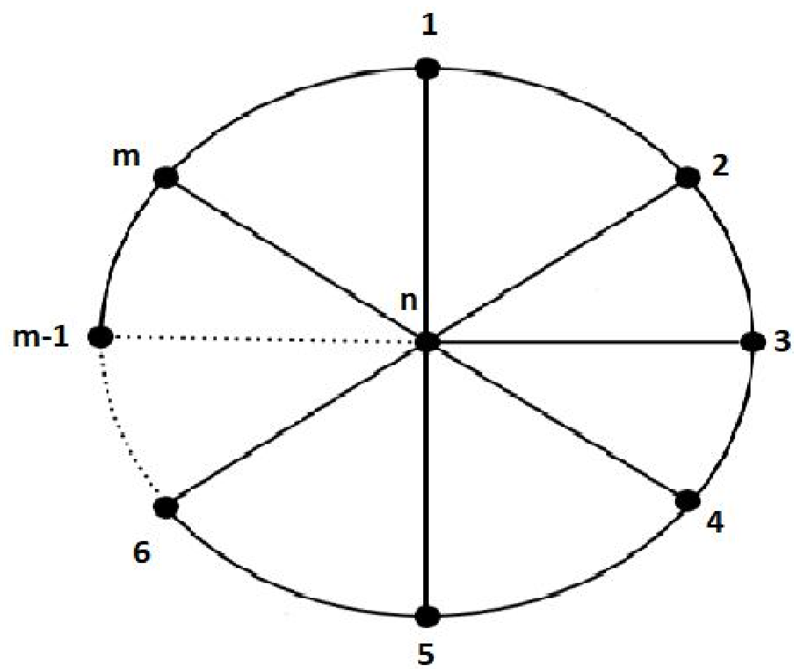

Fig 2.3: Wheel $K_1 \circ C_m$

Clearly, $K_1 \circ C_m$ there are $(3,3)$ – edges, $(3, m)$ – edges, also

$x_{3,3} = nm, \quad x_{3,m} = nm.$

$$AZI(K_1 \circ C_m) = nm\left(\frac{3.3}{3+3-2}\right)^3 + nm\left(\frac{3m}{3+m-2}\right)^3$$

$$= nm\left(\frac{729}{64}\right) + nm\left(\frac{27m^3}{(m+1)^3}\right)$$

$$= \frac{729nm}{64} + \frac{27nm^4}{m^3+3m^2+3m+1}$$

$$= \frac{729mn(m^3+3m^2+3m+1)+64(27m^4n)}{64(m^3+3m^2+3m+1)}$$

$$= \frac{2457m^4n+2187m^3n+2187m^2n+729mn}{64m^3+192m^2+192m+64}$$

Theorem 2.3

Let G_1 and G_2 be two simple connected graphs then the Augmented Zareb index of corona product of C_n and K_1 is

$$\frac{1728mn+5832n}{512}$$

Proof:

The structure of Corona Product of C_n and K_1 is shown in fig.2.3 The graph $C_n \circ K_1$ has $n(m+1)$ vertices and $n+nm$ edges.

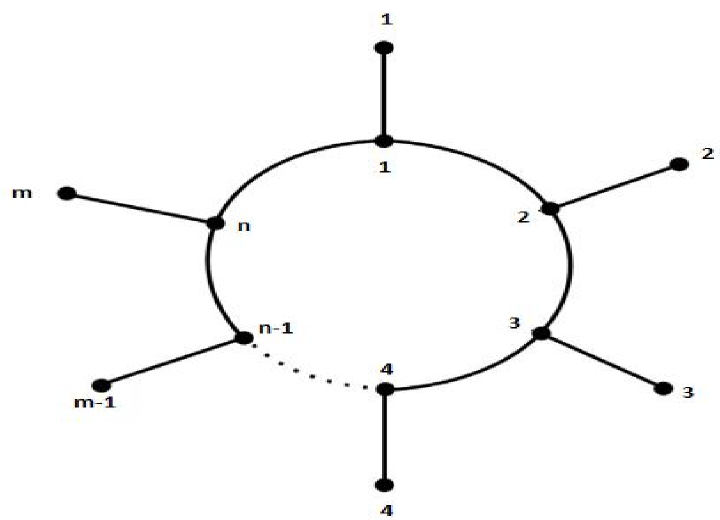

Fig 2.3:Sun $C_n \circ K_1$

Clearly, $C_n \circ K_1$ there are $(1,3)$ – edges, $(3,3)$ – edges, also

$x_{1,3} = nm, \quad x_{3,3} = n$

$$AZI(C_n \circ K_1) = nm\left(\frac{1 \cdot 3}{1+3-2}\right)^3 + n\left(\frac{3 \cdot 3}{3+3-2}\right)^3$$

$$= nm\left(\frac{27}{8}\right) + n\left(\frac{729}{64}\right)$$

$$= \frac{64(27nm) + 8(729n)}{8 \cdot 64}$$

$$= \frac{1728mn + 5832n}{512}$$

Theorem 2.4

Let G_1 and G_2 be two simple connected graphs then the Augmented Zagreb index of corona product of K_1 and P_m is

$$\frac{2457m^4n + 3456m^3n - 4374m^2n - 5832mn - 2187n - 4864m^3 + 6144m^2 + 6144m + 2048}{64m^3 + 192m^2 + 192m + 64}$$

Proof:

The structure of corona product of K_1 and P_m is shown in fig.2.4 The graph $K_1 \circ P_m$ has $n(m+1)$ vertices and $2nm - n$ edges.

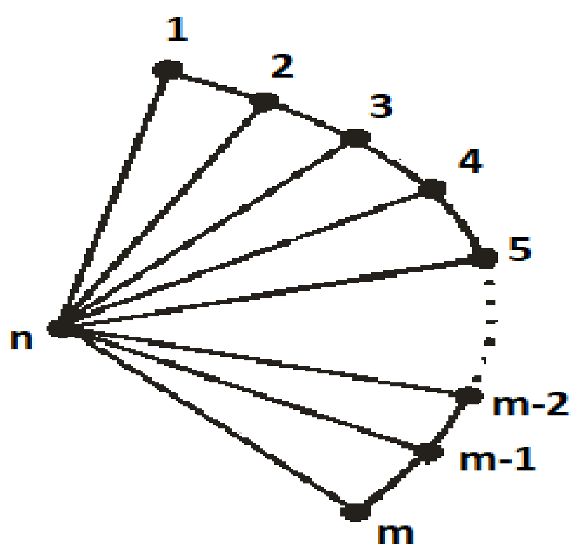

Fig 2.4: Fan $K_1 \circ P_m$

Clearly, $K_1 \circ P_m$ there are $(2,3)-$ edges, $(2,m)-$ edges, $(3,3)-$ edges, $(3,m)-$ edges,

also $x_{2,3} = 2, \quad x_{2,m} = 2, \quad x_{3,3} = n(m-3), \quad x_{3,m} = (nm + 2n - 4)$.

$$AZI(K_1 \circ P_m) = 2\left(\frac{2 \cdot 3}{2+3-2}\right)^3 + 2\left(\frac{2m}{2+m-2}\right)^3 + n(m-3)\left(\frac{3 \cdot 3}{3+3-2}\right)^3 + (nm+2n-4)\left(\frac{3m}{3+m-2}\right)^3$$

$$= 2\left(\frac{6}{3}\right)^3 + 2\left(\frac{8m^3}{m^3}\right) + (mn-3n)\left(\frac{9}{4}\right)^3 + (nm+2n-4)\left(\frac{27m^3}{(m+1)^3}\right)$$

$$= 2\left(\frac{216}{27}\right) + 16 + (mn-3n)\left(\frac{729}{64}\right) + \frac{27m^4n + 54m^3n - 108m^3}{m^3 + 3m^2 + 3m + 1}$$

$$= 32 + \frac{2457m^4n + 3456m^3n - 4374m^2n - 5832mn - 2187n - 6912m^3}{64m^3 + 192m^2 + 192m + 64}$$

$$= \frac{32\left(64m^3 + 192m^2 + 192m + 64\right) + 2457m^4n + 3456m^3n - 4374m^2n - 5832mn - 2187n - 6912m^3}{64m^3 + 192m^2 + 192m + 64}$$

$$= \frac{2457m^4n + 3456m^3n - 4374m^2n - 5832mn - 2187n - 4864m^3 + 6144m^2 + 6144m + 2048}{64m^3 + 192m^2 + 192m + 64}$$

III. CONCLUSION

In this paper, Augmented Zagreb index of corona product of graphs are discussed. Some special graphs have been proved under Augmented Zagreb index of corona product of graphs. This index can be use as a numerical description with chemical, physical and biological parameters to study about its relationships.

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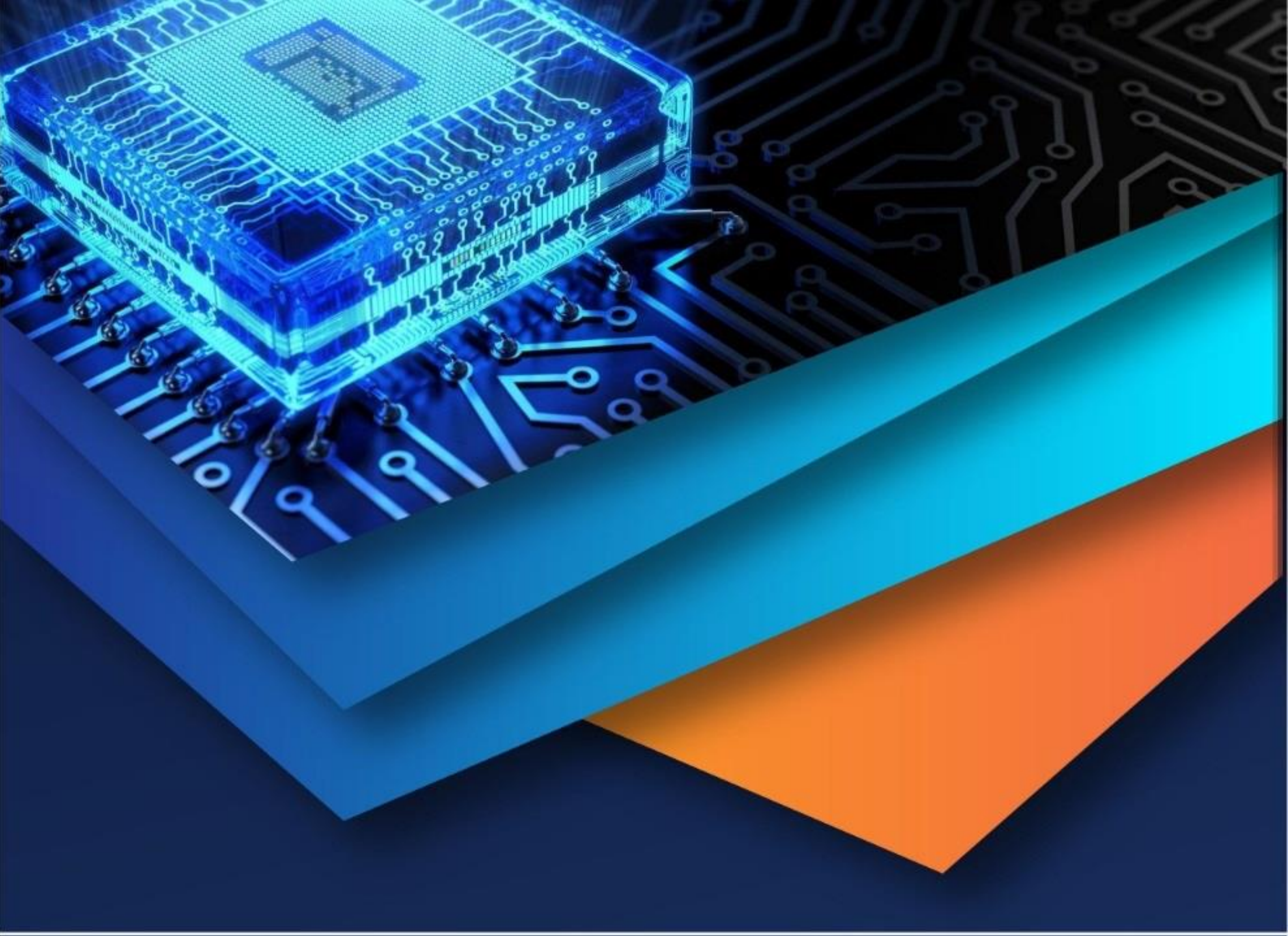

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