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# Augmented Zagreb Index of Corona Product of Some Special Graphs

E.Litta[1], S. Narmadha[2]
[1]*Associate Professor,* [2]*PG Student, PG and Research Department of Mathematics, Cauvery College for Women(Autonomous) Trichy – 18.*

***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

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

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.

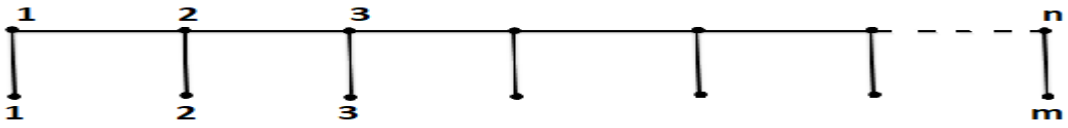


Fig 2.1: Comb $P_n\circ K_1$

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.

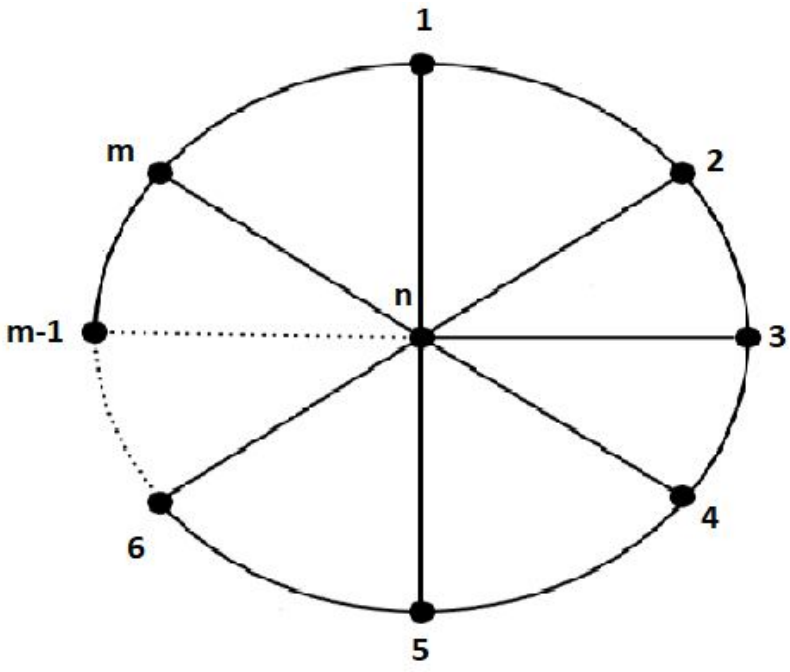


Fig 2.3: Wheel $K_1 \circ C_m$

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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.

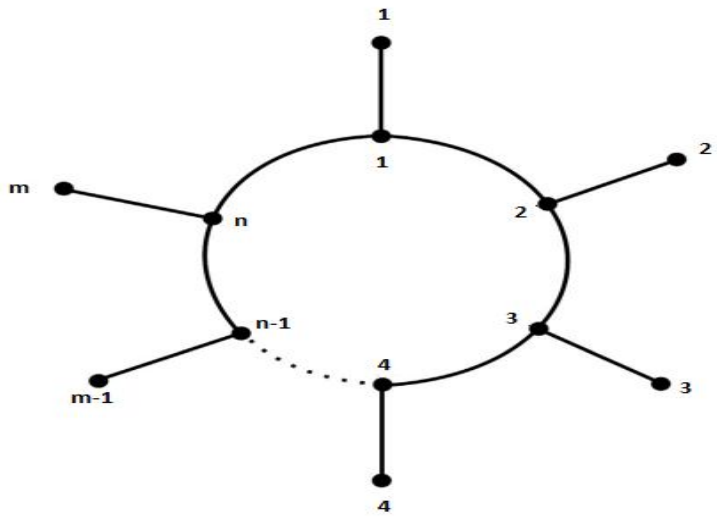



**Fig 2.3:Sun $C_n \circ K_1$**

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.

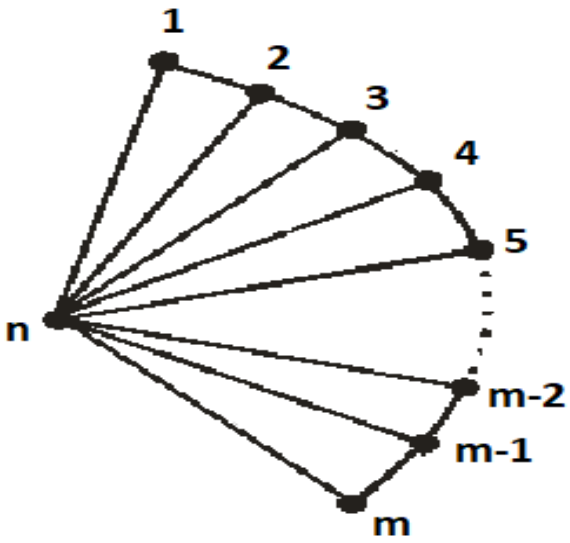



**Fig 2.4: Fan $K_1 \circ P_m$**

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

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

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

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

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

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

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

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

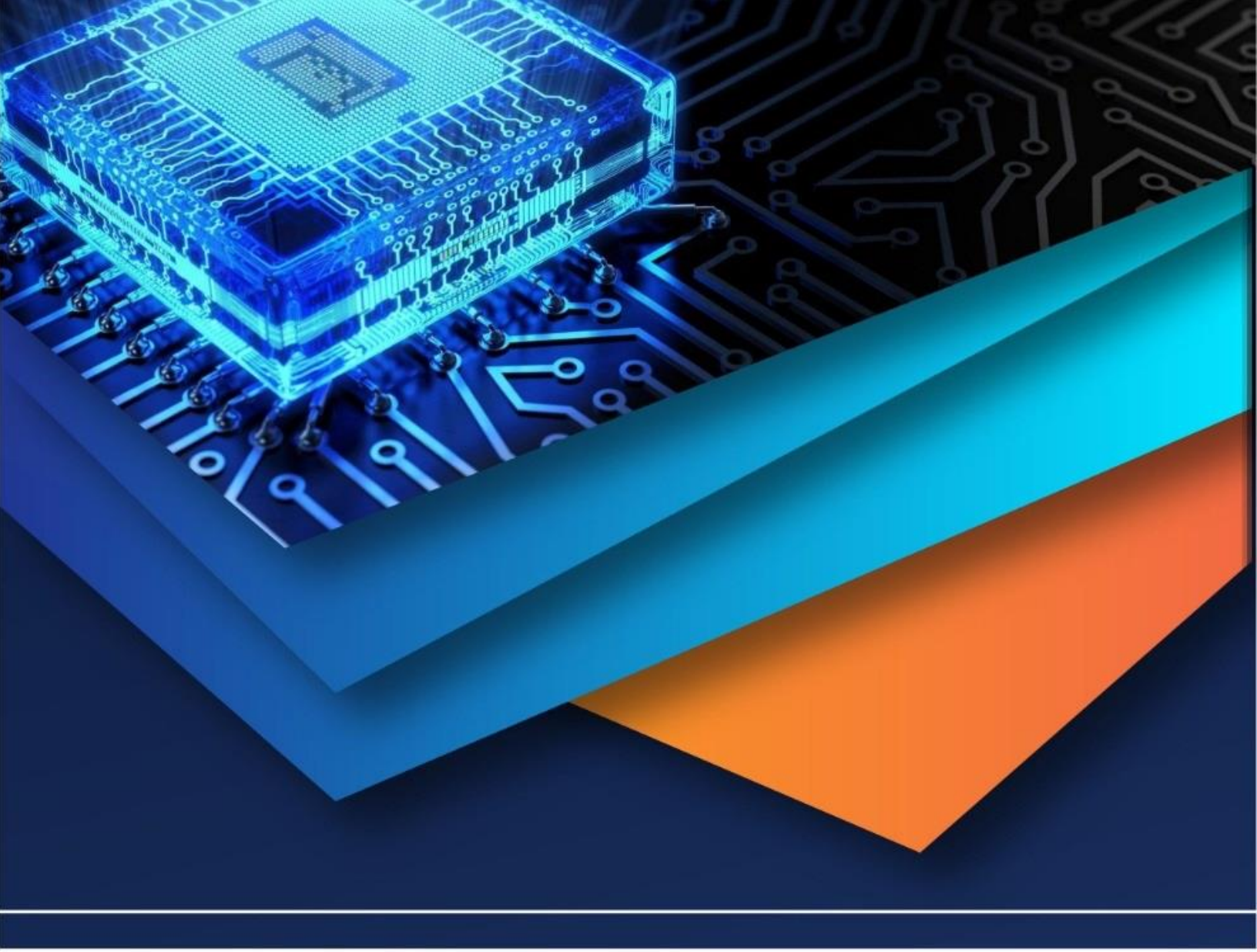
## III. CONCLUSION

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.

## REFERENCES

[1] AmalorpavaJerline, J., Litta E., Dhanalakshmi K., Benedict Michael Raj L.,F-Index of Generalized Mycielskian Graphs, International Journal of Recent Scientific Research, Volume 10, Issue 6, June 2019,P.No.:32366-32371.
[2] Bodendick, R. and Walther, G., On number theoretical methods in graph labelingsRes.Exp.Maths (2,/1995) 3-25.
[3] Bloom, D.F. Hsu, On graceful directed graphs, SIAMJ, Alg. Discrete Math.,6(1985),519-536.
[4] Felix J., Litta E., Benedict Micheal Raj L., Changing and Unchanging properties of Single Chromatic Transversal Domination Number of Graphs, International Journal of Mathematics Trends and Technology, Volume 52, Issue 4, Dec 2017,P.No.:262-266.
[5] Felix J., Litta E., Benedict Micheal Raj L., Single Chromatic Transversal Dominating Irredundant Number for odd cycles, Peterson graph and Mycielski graph, Infokara Research, Volume 8, Issue 10, Oct 2019,P.No.:139-145.
[6] Felix J., Litta E., Benedict Micheal Raj L., Single Chromatic Transversal Dominating Irredundant Number of graphs, Adalya Journal, Volume 10, Issue 8, Oct 2019,P.No.:264-272.
[7] Harary, F., Graph Theory, New Delhi: Narosa Publishing House, 2001.
[8] LinaZheng, Yiqiao Wang and WeifanWang,The Difference of Zagreb Indices of Halin Graphs, Axioms, 2023, 12, 450, 1 – 13.
[9] Litta E., AmalorpavaJerline J.,DhanalakshmiK.,BenedictMicheal Raj L.,andModified Zagreb Indices of Bridge Graphs, International Journal of Mathematical Archive, Volume 8, Issue 3, Mar 2017,P.No.: 86-91.
[10] Litta E., AmalorpavaJerline J., Rasika R., F- Co-index of Generalized Mycielskian Graphs, International Journal of Research in Advent Technology, Volume 7, Issue 4, Apr 2019,P.No.:243-249.
[11] Litta E., AmalorpavaJerline J., Felix J., Benedict Micheal Raj L.,First and Second Modified Zagreb Indices of Product Graphs, InfokaraResearch,Volume 9, Issue 1, Jan 2020,P.No.: 279-293.
[12] Litta, E., Datchini, S, Proper Colourings in r – Regular Zagreb Index Graph", Aryabhatta Journal of Mathematics and Informatics, Volume 15, Issue 1, Jan - June 2023. Pg. No. 149-154, Impact Factor: 5.856, ISSN No: 0975-7139(P) 2394-9309.
[13] Litta, E., Jayavarshini, N., Proper Colourings in r – Regular Randic Index Graph",International Journal for Research in Applied Science and Engineering Technology (IJRASET),Volume12,Issue,II, February 2024 Pg. No. 1603-1607.
[14] Litta, E., Narmadha, S., Proper Colourings in r – Regular Inverse Sum Indeg Index Graph",Research and Applications Towards Mathematics and Computer Science,Volume 9, February 2024, Pg. No. 66-76, Print ISBN: 978-81-970187-8-7, eBook ISBN: 978-81-970187-9-4.
[15] Prakash, V., Gopi, R., Shalini, P., Anti Skolem Mean Labeling of Quadrilateral Snake Related Graphs, TuijinJishu/Journal of Propulsion Technology, Vol. 44, No. 5(2023), 495 – 500.
[16] SadikDelen, Musa Demirci, AhmetSinanCevik and Ismail NaciCangul, On Omega Index and Average Degree of Graphs, Journal of Mathematics, Volume 2021, 1 – 5.
[17] Saridha, S. and HaridhaBanu. S, A New Direction Towards Plus weighted Grammar, International Journal for Research in Applied Science and Engineering Technology (IJRASET), ISSN: 2321 – 9653, Vol. 11, Issue II, February 2023.
[18] Saridha, S. and Jothika, T, An Introduction to Plus Weighted Dendrolanguage and its properties, Aryabhatta Journal of Mathematics and Informatics, Volume 15, Issue 1, Jan -June 2023. Pg. No. 93-100, Impact Factor: 5.856, ISSN No: 0975-7139(P) 2394-9309.
[19] Saridha, S. and HaridhaBanu. S, An Innovative ideas on plus weighted linear grammer, Aryabhatta Journal of Mathematics and Informatics, Volume 15, Issue 2, December 2023. Pg. No. 173 – 178.
[20] Shalini. P, Paul Dhayabaran. D., Proper Colourings in Magic and Anti-magic Graph, International Journal of Engineering and Research Technology, Vol. 3, Issue. 2, pages 815-818. February 2014.
[21] Shalini, P., Paul Dhayabaran, D., An Absolute Differences of Cubic and Square Difference Labeling, International Journal of Advanced Scientific and Technical Research, May-June 2015, Issue-5, Volume-3, pages 1-8.
[22] Shalini, P., Paul Dhayabaran, D., A Study on Root Mean Square Labelings in Graphs,International Journal of Engineering Science and Innovative Technology, May 2015, Volume-4, Issue-3, pages 305-309.
[23] Shalini, P., Gowri, R., Paul Dhayabaran, D., An Absolute Differences of Cubic and Square Difference Labeling For Some Families Of Graphs, The International journal of analytical and experimental modal analysis, Volume XI, Issue 10, October 2019, Page no: 538-544.
[24] Shalini, P., Meena, S.A., Lehmer-4 Mean Labeling for Some Path Related Graphs, Aryabhatta Journal of Mathematics and Informatics, Volume 15, Issue 1, Jan -June 2023. Pg. No. 105-110.
[25] Shalini, P., Skolem Odd Vertex Graceful Signed Graphs for Star Graphs, International Journal of Mathematics Trends and Technology, Volume 69, Issue 8, August 2023, Pg. No. 30 – 35.,

[26] Shalini, P., Prema, S., Vertex Sum Cube Labeling For Split and Mirror Graphs,International Journal for Research in Applied Science and Engineering Technology (IJRASET),Volume12, Issue II, February 2024, Pg. No.1598-1602
[27] Shalini, P.,Priyadharshini, K., SP Mean Differences Labeling for Some Families of Graphs,Research and Applications Towards Mathematics and Computer Science,Volume 9, Pg. No. 1-12, B P International, Print ISBN: 978-81-970187-8-7, eBook: 978-81-970187-9-4



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