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# Gaussian Anti Magic Labeling on Joining of Cricket Graph, Dart Graph, Diamond Graph and Domino Graph

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**Abstract**: A Gaussian antimagic labeling has introduced by Thirusangu et al. Gaussian antimagic labeling which is defined in a $G(p,q)$ graph, function can be defined as $f: V \rightarrow \{\, g + ih \,/\, g, h \in N\}, 1 \leq g < h \leq q$, so that we interpret the induced function $\tau: E \rightarrow N$ defined by $f^*(ab) = |f(a)|^2 + |f(b)|^2$ results of all the elements are well defined and different. A graph that accepts Gaussian antimagic labeling is known as Gaussian antimagic graph. In this paper we demonstrate the persistence of Gaussian antimagic labeling for some special graphs like Joining of Cricket graph, Dart graph, Diamond graph and Domino graph.
**Keywords:** Graph Labeling, Gaussain antimagic, Joining of Cricket graph, Dart graph, Diamond graph and Domino graph.

## I. Introduction

The study of graphs, which are mathematical structures used to model pair wise relations between objects from a certain collection is known as Graph Theory. An ordered pair $G\ (V, E)$ is said to be $(p, q)$ graph where $p = |V|$ vertices and $q = |E|$ edges [2, 4]. Nearly all the graph labeling methods drawn up their source to one introduced by Rosa [5]. An useful survey to know about the numerous graph labeling methods is the one by J.A. Gallian recently [3]. The operation of the join of graphs was formally defined by the Swiss-Canadian Mathematician G. Sabidussi in his 1961. While the field of graph theory was founded by Leonhard Euler in 1736, the more advanced formal operations combining graphs developed much later in the 20th century as the field expanded. In graph theory, the join of two or more graphs is an operation that connects every vertex of one graph to every vertex of the other graph. Thirusangu & Selvaganapathy [1] introduced the Gaussian antimagic labeling in many graphs. Motivated by the study, in the present work, we have evaluated the persistence of Gaussian antimagic labeling for some notable graphs like joining of Cricket graph, Dart graph, Diamond graph and Domino graph.

## II. Preliminaries

Within this part we deliver basic definitions and additional details which are prerequisites for the present investigations.

**Definition: 2.1** A planar undirected graph with five vertices is called Cricket graph it has five edges in the form of a triangle with two supplementary pendant vertices attached to the same vertex of the triangle.

**Definition: 2.2** A Dart graph is a specific graph structure with five vertices created by taking a diamond graph and adding a new vertex adjacent to one of the two vertices that had degree three in the diamond.

**Definition: 2.3** The Diamond graph is a simple undirected graph with four vertices and five edges created by removing one edge form a complete graph on four vertices.

**Definition: 2.4** G is a Domino graph if every vertex of G is contained in at most two maximal cliques of G.

## III. Primary Results

**Theorem 3.1:** The graph which verifies Gaussian antimagic labeling is the joining of Cricket.

**Proof:** Entitle $V = \{v_1, v_2, v_3, \ldots, v_{5r}\}$ be the apex and $E = \{\{ v_{5q-4}\, v_{5q-3} \,/\, 1 \le q \le r, r \in N \} \cup \{ v_{5q-3}\, v_{5q-2} \,/\, 1 \le q \le r, r \in N \} \cup \{ v_{5q-3}\, v_{5q-1} \,/\, 1 \le q \le r, r \in N \} \cup \{ v_{5q-3}\, v_{5q} \,/\, 1 \le q \le r, r \in N \} \cup \{ v_{5q-1}\, v_{5q} \,/\, 1 \le q \le r, r \in N \} \cup \{ v_{5q-2}\, v_{5q+1} \,/\, 1 \le q \le r, r \in N \}\}$ the joining of edges of the Cricket graph.

Function can be defined as $f: V \to \{g + ih \,/\, g, h \in N,\ h = g + 1,\ 1 \le g \le n\}$ so that $f(v_t) = t + i(t+1), 1 \le t \le n.$

To interpret the induced function $\tau: E \to N$ so that $f^*(ab) = |f(a)|^2 + |f(b)|^2$.

To acquire the edge labels:

$f^*( v_{5q-4}, v_{5q-3}) = 100q^2 - 120q + 38,\ 1 \le q \le r,\ r \in N$

$f^*( v_{5q-3}, v_{5q-2}) = 100q^2 - 80q + 18,\ 1 \le q \le r,\ r \in N$

$f^*( v_{5q-3}, v_{5q-1}) = 100q^2 - 60q + 14,\ 1 \le q \le r,\ r \in N$

$f^*( v_{5q-3}, v_{5q}) = 100q^2 - 40q + 14,\ 1 \le q \le r,\ r \in N$

$f^*( v_{5q-1}, v_{5q}) = 100q^2 + 2,\ 1 \le q \le r,\ r \in N$

$f^*( v_{5q-2}, v_{5q+1}) = 100q^2 + 10,\ 1 \le q \le r,\ r \in N$

Thus f *(E) = {18, 198,......,$100r^2 - 120r + 38$; 38, 258,......,$100r^2 - 80r + 18$; 54, 294,......,$100r^2 - 60r + 14$; 74, 334,......,$100r^2 - 40r + 14$; 102, 402,......,$100r^2 + 2$; 110, 410,......,$100r^2 + 10$} all the elements are well defined and different.

However, the graph which verifies Gaussian antimagic labeling is the joining of Cricket.

**Theorem 3.2:** The graph which verifies Gaussian antimagic labeling is the joining of Dart.

**Proof:** Entitle V = {$v_1, v_2, v_3, \ldots, v_{5r}$} be the apex and E ={{ $v_{5q-4}\, v_{5q-3}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{5q-4}\, v_{5q-1}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{5q-3}\, v_{5q-2}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{5q-3}\, v_{5q-1}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{5q-2}\, v_{5q-1}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{5q-1}\, v_{5q}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{5q}\, v_{5q+2}$ / $1 \le q \le r, r \in N$ }} the joining of edges of the Dart graph.

Function can be defined as $f: V \to \{g + ih \,/\, g, h \in N,\ h = g + 1,\ 1 \le g \le n\}$ so that $f(v_t) = t + i(t + 1), 1 \le t \le n.$

To interpret the induced function $\tau: E \to N$ so that $f^*(ab) = |f(a)|^2 + |f(b)|^2$.

To acquire the edge labels:

f *( $v_{5q-4}$, $v_{5q-3}$) = $100q^2 - 120q + 38$, $1 \le q \le r$, $r \in N$

f *( $v_{5q-4}$, $v_{5q-1}$) = $100q^2 - 80q + 26$, $1 \le q \le r$, $r \in N$

f *( $v_{5q-3}$, $v_{5q-2}$) = $100q^2 - 80q + 18$, $1 \le q \le r$, $r \in N$

f *( $v_{5q-3}$, $v_{5q-1}$) = $100q^2 - 60q + 14$, $1 \le q \le r$, $r \in N$

f *( $v_{5q-2}$, $v_{5q-1}$) = $100q^2 - 40q + 6$, $1 \le q \le r$, $r \in N$

f *( $v_{5q-1}$, $v_{5q}$) = $100q^2 + 2$, $1 \le q \le r$, $r \in N$

f *( $v_{5q}$, $v_{5q+2}$) = $100q^2 + 60q + 4$, $1 \le q \le r$, $r \in N$

Thus f *(E) = {18, 198,......,$100r^2 - 120r + 38$; 46, 266,......,$100r^2 - 80r + 26$; 38, 258,......,$100r^2 - 80r + 18$; 54, 294,......,$100r^2 - 60r + 14$; 66, 326,......,$100r^2 - 40r + 6$; 102, 402,......,$100r^2 + 2$; 174, 534,......,$100r^2 + 60q + 14$} all the elements are well defined and different.

However, the graph which verifies Gaussian antimagic labeling is the joining of Dart.

**Theorem 3.3:** The graph which verifies Gaussian antimagic labeling is the joining of Diamond.

**Proof:** Entitle V = {$v_1, v_2, v_3, \ldots, v_{4r}$} be the apex and E ={{ $v_{4q-3}\, v_{4q-2}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{4q-3}\, v_{4q}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{4q-2}\, v_{4q}$ / $1 \le q \le r, r \in N$ } ∪ { $v_{4q-2}\, v_{4q-1}$ / $1 \le q \le r, r \in N$

}∪ { $v_{4q-1}$ $v_{4q}$ / $1 \le q \le r$, r ∈ N }∪ { $v_{4q}$ $v_{4q+2}$ / $1 \le q \le r$, r ∈ N }} the joining of edges of the Diamond graph.

Function can be defined as $f: V \to \{g + ih /\ g, h \in N,\ h = g + 1,\ 1 \le g \le n\}$ so that $f(v_t) = t + i(t + 1), 1 \le t \le n.$

To interpret the induced function $\tau: E \to N$ so that $f^*(ab) = |f(a)|^2 + |f(b)|^2$.

To acquire the edge labels:

$f^*(v_{4q-3}, v_{4q-2}) = 64q^2 - 64q + 18$, $1 \le q \le r$, r ∈ N

$f^*(v_{4q-3}, v_{4q}) = 64q^2 - 32q + 14$, $1 \le q \le r$, r ∈ N

$f^*(v_{4q-2}, v_{4q}) = 64q^2 - 16q + 6$, $1 \le q \le r$, r ∈ N

$f^*(v_{4q-2}, v_{4q-1}) = 64q^2 - 32q + 6$, $1 \le q \le r$, r ∈ N

$f^*(v_{4q-1}, v_{4q}) = 64q^2 + 2$, $1 \le q \le r$, r ∈ N

$f^*(v_{4q}, v_{4q+2}) = 64q^2 + 48q + 14$, $1 \le q \le r$, r ∈ N

Thus $f^*(E)$ = {18, 146,......,$64r^2 - 64r + 18$; 46, 206,......,$64r^2 - 32r + 14$; 54, 230,......,$64r^2 - 16r + 6$; 38, 198,......,$64r^2 - 32r + 6$; 66, 258,......,$64r^2 + 2$; 126, 366,..... ,$64r^2 + 48r + 14$} all the elements are well defined and different.

However, the graph which verifies Gaussian antimagic labeling is the joining of Diamond.

**Theorem 3.4:** The graph which verifies Gaussian antimagic labeling is the joining of Domino.

**Proof:** Entitle V = {$v_1$, $v_2$, $v_3$, …, $v_{6r}$} be the apex and E ={{ $v_{6q-5}$ $v_{6q-4}$ / $1 \le q \le r$, r ∈ N } ∪ { $v_{6q-3}$ $v_{6q-2}$ / $1 \le q \le r$, r ∈ N } ∪ { $v_{6q-1}$ $v_{6q}$ / $1 \le q \le r$, r ∈ N } ∪ { $v_{6q-5}$ $v_{6q-3}$ / $1 \le q \le r$, r ∈ N }∪ { $v_{6q-3}$ $v_{6q-1}$ / $1 \le q \le r$, r ∈ N } ∪ { $v_{6q-4}$ $v_{6q-2}$ / $1 \le q \le r$, r ∈ N } ∪ { $v_{6q-2}$ $v_{6q}$ / $1 \le q \le r$, r ∈ N } ∪ { $v_{6q}$ $v_{6q+5}$ / $1 \le q \le r$, r ∈ N }} the joining of edges of the Domino graph.

Function can be defined as $f: V \to \{g + ih /\ g, h \in N,\ h = g + 1,\ 1 \le g \le n\}$ so that $f(v_t) = t + i(t + 1), 1 \le t \le n.$

To interpret the induced function $\tau: E \to N$ so that $f^*(ab) = |f(a)|^2 + |f(b)|^2$.

To acquire the edge labels:

$f^*(v_{6q-5}, v_{6q-4}) = 144q^2 - 192q + 66$, $1 \le q \le r$, r ∈ N

$f^*(v_{6q-3}, v_{6q-2}) = 144q^2 - 96q + 18$, $1 \le q \le r$, r ∈ N

$f^*(v_{6q-1}, v_{6q}) = 144q^2 + 2$, $1 \le q \le r$, r ∈ N

$f^*(v_{6q-5}, v_{6q-3}) = 144q^2 - 168q + 54, 1 \le q \le r, \ r \in N$

$f^*(v_{6q-3}, v_{6q-1}) = 144q^2 - 72q + 14, 1 \le q \le r, \ r \in N$

$f^*(v_{6q-4}, v_{6q-2}) = 144q^2 - 120q + 30, 1 \le q \le r, \ r \in N$

$f^*(v_{6q-2}, v_{6q}) = 144q^2 - 24q + 6, 1 \le q \le r, \ r \in N$

$f^*(v_{6q}, v_{6q+5}) = 144q^2 + 144q + 62, 1 \le q \le r, \ r \in N$

Thus $f^*(E) = \{18, 258,......,144r^2 - 192r + 66; 66, 402,......,144r^2 - 96r + 18; 146, 578,......,144r^2 + 2; 30, 294,......,144r^2 - 168r + 54; 86, 446,......,144r^2 - 72r + 14; 54, 366,......,144r^2 - 120r + 30; 126, 534,......,144r^2 - 24r + 6; 350, 926,. .... ,144r^2 + 144r + 62\}$ all the elements are well defined and different.

However, the graph which verifies Gaussian antimagic labeling is the joining of Domino.

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