[Volume 2 issue 9 September 2014]
Page No.606-618 ISSN :2320-7167

INTERNATIONAL JOURNAL OF MATHEMATICS AND COMPUTER RESEARCH

Some Results on Prime Labeling Of Graphs

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ABSTRACT

A Graph G with n vertices is said to admit prime labeling if its vertices can be labeled with distinct positive integers not exceeding n such that the labels of each pair of adjacent vertices are relatively prime. A graph G which admits prime labeling is called a prime graph. In this paper we investigate prime labeling of some graphs related to helm H_n, Gear graph G_n , Crown C_n^* and star S_n. We discuss prime labeling in the context of graph operation namely duplication.

Keywords: Graph Labeling, Prime Labeling, Duplication, Prime Graph.

1. INTRODUCTION

In this paper, We consider only finite simple undirected graph. The graph G has vertex set V = V(G) and edge set E= E(G). The set of vertices adjacent to a vertex u of G is denoted by N(u). For notations and terminology we refer to Bondy and Murthy[1].

The notion of prime labeling was introduced by Roger Entringer and was discussed in a paper by Tout [7]. Two integers a and b are said to be relatively prime if their greatest common divisor is 1. Relatively prime numbers play an important role in both analytic and algebraic number theory. Many researchers have studied prime graph. Fu.H [3] has proved that the path P_n on n vertices is a prime graph. Deretsky et al [2] have prove that the cycle C_n on n vertices is a prime graph. Around 1980 Roger Etringer conjectured that all trees have prime labeling which is not settled till today.

The Prime labeling for planar grid is investigated by Sundaram et al [6], Lee.S.et.al [4] has proved that the wheel W_n is a prime graph if and only if n is even.

Duplication of a vertex v_k of a graph produces a new graph G_k by adding a vertex v'_k with $N(v'_k) = N(v_k)$.

The graph obtained by duplicating all the vertices of a graph G is called duplication of G.

In [8] S. K. Vaidhya and K. K. Kanmani have proved that the graphs obtained by identifying any two vertices, duplicating arbitrary vertex and switching of any vertex in cycle C_n admit prime labeling.

The helm H_n is a graph obtained from a wheel by attaching a pendant edge at each vertex of the n-cycle.

The crown graph C_n^* is obtained from a cycle C_n by attaching a pendent edge at each vertex of the n-cycle.

The gear graph G_n is, the graph obtained from wheel $W_n = C_n + K_1$ by subdividing each edge incident with the apex vertex once.

In [5] Meena and Vaithilingam have proved that the graphs obtained by identifying any two vertices, duplicating any arbitrary vertex and switching any vertex in Helm graph admit prime labeling.

In this paper we prove that the graph obtained by duplication of all rim vertices of the Helm H_n, and all the vertices of the Helm H_n except the center vertex. The graph obtained by duplicating all the rim vertices of the crown C_n^* and all the vertices of C_n^*, the graph obtained by duplicating all the vertices of the gear graph G_n, except the central vertex and duplication graph of the star graph, are all prime graphs.

2. MAIN RESULTS

Theorem 2.1

The graph G obtained by duplicating all the vertices in the rim of helm H_n is a prime graph. if n is even.

Proof.

Let $V(H_n) = \{ c, u_i, v_i \ / \ 1 \leq i \leq n\}$

$E(H_n) = \{cu_i, u_i v_i \ / \ 1 \leq i \leq n \} \cup \{u_i u_{i+1} / \ 1 \leq i \leq n-1\} \cup \{u_1 u_n\}$

Let G be the graph obtained by duplicating all the rim vertices in H_n and let the new vertices be $u'_1, u'_2, \dots, u'_n$. then,

$V(G) = \{ c, u_i, v_i, u_i' \ / \ 1 \le i \le n\}$

$E(G) = \{ cu_i, cu_i', u_iv_i, v_iu_i' / 1 \le i \le n\} \cup$

$\{ u_iu_{i+1}, u_iu_{i+1}', u_i'u_{i+1} / 1 \le i \le n-1\} \cup \{ u_nu_1, u_nu_1', u_n'u_1\}$

$|V(G)| = 3n + 1, \quad |E(G)| = 7n$

Define a labeling $f : V(G) \to \{1,2,3, \dots, 3n+1\}$ as follows

Let $f(c) = 1$,

$f(u_i) = 3i - 1, \quad for\ 1 \le i \le n, \quad i \not\equiv 2 (mod\ 5)$

$f(v_i) = 3i, \quad for\ 1 \le i \le n$

$f(u_i') = 3i + 1, \quad for\ 1 \le i \le n, \quad i \not\equiv 2 (mod\ 5)$

$f(u_i) = 3i + 1, \quad for\ 1 \le i \le n, \quad i \equiv 2 (mod\ 5)$

$f(u_i') = 3i - 1, \quad for\ 1 \le i \le n, \quad i \equiv 2 (mod\ 5)$

since $f(c) = 1$,

$\gcd\big(f(c), f(u_i)\big) = 1, \quad for\ 1 \le i \le n$

$\gcd\big(f(c), f(u_i')\big) = 1, \quad for\ 1 \le i \le n$

clearly,

$\gcd\Big(f(u_i), f\big(v_i\ \big)\Big) = \gcd(3i - 1, 3i) \quad = 1 \quad for\ 1 \le i \le n$

$\gcd\big(f(v_i), f(u_i')\big) = \gcd(3i, 3i + 1) \quad = 1 \quad for\ 1 \le i \le n$

$\gcd\big(f(u_i), f(u_{i+1})\big) = \gcd(3i - 1, 3i + 2) = 1 \quad for\ 1 \le i \le n - 1$

as one of these numbers is even then the other number is odd. Also the difference of these two numbers is 3.

$\gcd\big(fu_1), f(u_n)\big) \quad = \gcd(2, 3n - 1) \quad = 1$ since n is even and $3n - 1$ is odd.

$\gcd\Big(f(u_i'), f\big(u_{i+1}\big)\Big) = \gcd(3i + 1, 3i + 2) = 1 \quad for\ 1 \le i \le n - 1.$

$\gcd\Big(f\big(u_i\ \big), f(u_{i+1}')\Big) = \gcd(3i - 1, 3i + 4) = 1 \quad if \quad i \not\equiv 2 (mod\ 5)$

then $3i - 1$ is not multiple of 5.

$\gcd\Big(f\big(u_i\ \big), f(u_{i+1}')\Big) = \gcd(3i + 1, 3(i + 1) + 1)$

$= \gcd(3i + 1, 3i + 4) = 1 \quad if \quad i \equiv 2 (mod\ 5)$

$\gcd\Big(f(u_1'), f\big(u_n\ \big)\Big) = \gcd(4, 3n - 1) \quad = 1$ since $3n - 1$ is odd.

$\gcd\Big(f(u_n'), f\big(u_1\ \big)\Big) = \gcd(3n + 1, 2) \quad = 1$ since n is even and $3n + 1$ is odd.

then f is a prime labeling

thus G is a prime graph.

Theorem 2.2

The graph G obtained by duplicating all the vertices of the helm H_n , except the apex vertex,is a prime graph.

proof:

Let $V(H_n) = \{ c, u_i, v_i \ / \ 1 \leq i \leq n\}$

$E(H_n) = \{cu_i, u_i v_i \ / \ 1 \leq i \leq n \} \cup \{u_i u_{i+1} / \ 1 \leq i \leq n-1\} \cup \{u_1 u_n\}$

Let G be the graph obtained by duplicating all the vertices in the helm H_n , except the apex vertex c.

Let $u_1', u_2', \dots, u_n', and \ v_1', v_2', \dots, v_n'$ be the new vertices of G by duplicating $u_1, u_2, \dots, u_n$ and $v_1, v_2, \dots, v_n$, then

$V(G) = \{ c, u_i, v_i, u_i', v_i' / \ 1 \leq i \leq n\}$

$E(G) = \{ cu_i, cu_i', u_i v_i, v_i u_i', u_i v_i' / 1 \leq i \leq n\} \cup \{u_i u_{i+1} / 1 \leq i \leq n-1\} \cup$
$\{ u_i u_{i+1}', u_{i-1}' u_i / 2 \leq i \ \leq n-1\} \cup \{ u_n u_1, u_n u_1', u_n' u_1, u_1 u_2'\}$

$|V(G)| = 4n+1, \qquad |E(G)| = 8n$

Define a labeling $f : V(G) \rightarrow \{1,2,3, \dots, 4n+1\}$ as follows

Let $f(c) = 1, \ \ f(u_1) = 4, \ f(u_1') = 2 \ and \ f(v_1) = 3$

$f(u_i) = 4i-1, \qquad for\ 2 \leq i \leq n, \qquad i \not\equiv 1 (mod\ 3)$

$f(v_i) = 4i-2, \qquad for\ \ 2 \leq i \leq n$

$f(u_i') = 4i-3, \qquad for\ 2 \leq i \leq n, \qquad i \not\equiv 1 (mod\ 3)$

$f(v_i') = 4i, \qquad for\ 2 \leq i \leq n,$

$f(v_1') = 4n+1,$

$f(u_i) = 4i-3, \qquad for\ 2 \leq i \leq n, \qquad i \equiv 1 (mod\ 3)$

$f(u_i') = 4i-1, \qquad for\ 2 \leq i \leq n, \qquad i \equiv 1 (mod\ 3)$

Since $f(c) = 1,$

$\gcd\big(f(c), f(u_i)\big) \quad = \ 1, \qquad for\ 1 \leq i \leq n$

$\gcd\ (f(c), f(u_i')) \quad = 1, \qquad for\ 1 \leq i \leq n$

$\gcd\big(f(u_i), f(v_i)\big) \quad = \gcd(4i-1, 4i-2) = 1, \qquad for\ 1 \leq i \leq n$

$\gcd\big(f(v_i), f(u_i')\big) \quad = \gcd(4i-2, 4i-3) = 1, \qquad for\ 1 \leq i \leq n$

$\gcd\big(f(u_1), f(u_n)\big) \quad = \gcd(4, 4n-1) \qquad = 1, \qquad since\ 4n-1\ is\ odd$

$gcd(f(u_i), f(u_{i+1}')) = \gcd\ (4i-1, 4i+1) = 1, \qquad for\ \ 2 \leq i \leq n-1.$

as these two numbers are odd and difference is 2.

$\gcd(f(u_i), f(u'_{i-1})) = \gcd(4i-1, 4i-7) = 1$ if $i \not\equiv 1 (mod\ 3)$

$\gcd(f(u_i), f(u_{i-1})) = \gcd(4i-3, 4i-5) = 1$ if $i \equiv 1 (mod\ 3)$

$\gcd\big(f(u_i), f(u_{i+1})\big) = \gcd(4i-1, 4i+3) = 1$ as these two numbers are odd and difference is 4.

$\gcd\big(f(u_1), f(u'_n)\big) = \gcd(4, 4n-3) = 1,$ since $4n-3$ *is odd.*

$\gcd(f(u_n), f(u'_1)) = \gcd(4n-1, 2) = 1,$ since $4n-1$ *is odd.*

$\gcd\big(f(u_i), f(v'_i)\big) = \gcd(4i-1, 4i) = 1.$

Then f is a prime labeling.

Thus G is a prime graph.

Theorem 2.3

The graph obtained by duplicating all the rim vertices in crown C_n^* is a prime graph, if n is even.

Proof:

Let $V(C_n^*) = \{u_1, u_2, \dots, u_n, v_1, v_2, \dots, v_n\}$

$E(C_n^*) = \{u_i v_i / 1 \le i \le n\} \cup \{u_i u_{i+1} / 1 \le i \le n-1\} \cup \{u_n u_1\}$

Let G be the graph obtained by duplicating all the rim vertices in C_n^*

Let $u'_1, u'_2, \dots, u'_n$ be the new vertices of G by duplicating $u_1, u_2, \dots, u_n$ then

$V(G) = \{u_i, v_i, u'_i \ / \ 1 \le i \le n\}$

$E(G) = \{u_i v_i, v_i u'_i, u_i u'_{i+1} / 1 \le i \le n\} \cup \{u_i u_{i+1,} u'_i u_{i+1,} \ /1 \le i \le n-1\}$

$\cup \ \{u_n u_1, u_1 v_1, u'_n u_1\}$

$|V(G)| = 3n, \quad |E(G)| = 5n.$

Define a labeling $f : V(G) \to \{1,2,3, \dots, 3n\}$ as follows

Let $f(u_1) = 1,\ f(u'_1) = 3n-1$ *and* $f(v_1) = 3n$

$f(u_i) = 3i-2, \quad for\ 2 \le i \le n, \quad i \not\equiv 4 (mod\ 5)$

$f(v_i) = 3i-3, \quad for\ 2 \le i \le n$

$f(u'_i) = 3i-4, \quad for\ 2 \le i \le n, \quad i \not\equiv 4 (mod\ 5)$

$f(u_i) = 3i-4, \quad for\ 2 \le i \le n, \quad i \equiv 4 (mod\ 5)$

$f(u'_i) = 3i-2, \quad for\ 2 \le i \le n, \quad i \equiv 4 (mod\ 5)$

$\gcd\big(f(u_i), f(u_{i+1})\big) = \gcd(3i-2, 3i+1) = 1\ for\ 2 \le i \le n-1$

as these two numbers has one is even and other is odd and their difference is 3.

$$\gcd\left(f(u_n), f(u_1)\right) = \gcd(3n-2\,,1) \qquad = 1$$

$$\gcd\left(f(u_i), f(v_i)\right) = \gcd\,(3i-2\,, 3i-3) = 1 \quad for\ 2 \le i \le n$$

$$\gcd\left(f(v_i), f(u_i')\right) = \gcd\ (3i-3, 3i-4) = 1 \quad for\ 2 \le i \le n$$

$$\gcd\left(f(u_i'), f(u_{i+1})\right) = \gcd\,(3i-4, 3i+1) \ = 1 \quad if \ \ i \not\equiv 4(mod\ 5)$$

$$\gcd\left(f(u_i'), f(u_{i+1})\right) = \gcd(3i-2, 3(i+1)-4)$$

$$= \gcd(3i-2, 3i-1) \ = 1 \quad if\ \ i \equiv 4(mod\ 5)$$

$$\gcd\left(f(u_n'), f(u_1)\right) = \gcd(3n-4\ \,, 1)) \qquad = 1$$

$$\gcd\,(f(u_i), f(u_{i+1}') = \gcd\,(3i-2\,, 3i-1\,) = 1 \quad for\ 1 \le i \le n$$

$$\gcd\left(f(u_1), f(v_1)\right) = \gcd(1\,, 3n) \qquad = 1$$

$$\gcd\left(f(v_1), f(u_1')\right) = \gcd(3n\,, 3n-1) \qquad = 1$$

$$\gcd\left(f(u_n), f(u_1')\right) = \gcd\,(3n-2\,, 3n-1) = 1$$

Thus f is a prime labeling.

Hence G is a prime Graph.

Theorem 2.4

The graph obtained by duplicating all the vertices in crown C_n^* is a prime graph.

Proof :

Let $V(C_n^*) = \{u_1, u_2, \ldots, u_n, v_1, v_2, \ldots, v_n\}$

$E(C_n^*) = \{\, u_i v_i / 1 \le i \le n\} \cup \{\, u_i u_{i+1} / 1 \le i \le n-1\} \cup \{\, u_n u_1\}$

Let G be the graph obtained by duplicating all the vertices in C_n^*

Let $u_1', u_2', \ldots, u_n'$ and $v_1', v_2', \ldots, v_n'$ be the new vertices of G by duplicating $u_1, u_2, \ldots, u_n$ and $v_1, v_2, \ldots, v_n$ then

$V(G) = \{\, u_i, v_i, u_i', v_i' /\ 1 \le i \le n\}$

$E(G) = \{u_i v_i, v_i u_i', u_i v_i' / 1 \le i \le n\} \ \cup\ \{u_i u_{i+1,} u_i' u_{i+1,} u_i u_{i+1}' / 1 \le i \le n-1\}$

$\cup\ \{\, u_n u_1, u_n u_1', u_n' u_1\}$

$|V(G)| = 4n,\ |E(G)|\ = 6n.$

Define a labeling $f : V(G) \to \{1,2,3, \ldots, 4n\}$ as follows

Let $f(u_1) = 1,\ f(u_1') = 2\ \ and\ \ f(v_1) = 3.$

$$f(u_i) = 4i-1, \qquad for\ 2 \le i \le n, \qquad i \not\equiv 1(mod\ 3)$$

$f(v_i) = 4i - 2, \quad for\ 2 \le i \le n$

$f(u_i') = 4i - 3, \quad for\ 2 \le i \le n, \quad i \not\equiv 1(mod\ 3)$

$f(v_i') = 4i, \quad for\ 1 \le i \le n,$

$f(u_i) = 4i - 3, \quad for\ 2 \le i \le n, \quad i \equiv 1(mod\ 3)$

$f(u_i') = 4i - 1, \quad for\ 2 \le i \le n, \quad i \equiv 1(mod\ 3)$

$\gcd\left(f(u_i), f(u_{i+1})\right) = \gcd(4i-1, 4i+3) = 1, \ for\ 1 \le i \le n$

as these two numbers are odd and their difference is 4

$\gcd\left(f(u_n), f(u_1)\right) = \gcd(4n-1, 1) = 1$

$\gcd\left(f(u_i), f(v_i)\right) = \gcd(4i-1, 4i-2) = 1 \quad for\ 2 \le i \le n$

$\gcd\left(f(v_i), f(u_i')\right) = \gcd(4i-2, 4i-3) = 1 \quad for\ 2 \le i \le n$

$\gcd\left(f(u_i), f(v_i')\right) = \gcd(4i-1, 4i) = 1 \quad for\ 2 \le i \le n$

$\gcd\left(f(u_i), f(u_{i-1}')\right) = \gcd(4i-1, 4i-7) = 1 \quad for\ 2 \le i \le n-1\ , i \not\equiv 1(mod\ 3)$

as their difference is 6 and they are odd.

$\gcd\left(f(u_i), f(u_{i-1}')\right) = \gcd(4i-3, 4i-5) = 1 \quad if\ \ i \equiv 1(mod\ 3)$

since they are two consecutive odd numbers.

$\gcd\left(f(u_i), f(u_{i+1}')\right) = \gcd(4i-1, 4i+1) = 1 \quad for\ 2 \le i \le n-1$

$\gcd\left(f(u_1), f(u_n')\right) = \gcd(1, 4n-3) = 1$

$\gcd\left(f(u_n), f(u_1')\right) = \gcd(4n-1, 2) = 1$

Then f is a prime labeling.

Hence G is a prime graph.

Theorem 2.5

The graph obtained by duplicating all the vertices in Gear graph G_n, except the apex vertex, is a prime graph.

Proof :

$let\ V(G_n) = \{ c, u_i, v_i\ /1 \le i \le n\}$

$E(G_n) = \{cu_i, u_iv_i\ /\ 1 \le i \le n\} \cup \{v_iv_{i+1}\ /\ 1 \le i \le n-1\} \cup \{v_nv_1\}$

Let G be the graph obtained by duplicating all the vertices in Gear graph G_n, except the apex vertex.

Let $u_1', u_2', \dots, u_n'$ and $v_1', v_2', \dots, v_n'$ be the new vertices of G by duplicating $u_1, u_2, \dots, u_n$ and $v_1, v_2, \dots, v_n$ then

$V(G) = \{ c, u_i, v_i, u_i', v_i'/\ 1 \le i \le n\}$

$E(G) = \{cu_i, cu_i', u_iv_i, v_iu_i', u_iv_i'/1 \le i \le n\} \cup \{v_iv_{i+1}, v_iv_{i+1}', v_i'v_{i+1}\ /1 \le i \le n-1\}$

$$\cup \ \{v_n v_1', v_n' v_1, v_n v_1\}$$

$|V(G)| = 4n+1, \quad |E(G)| = 8n.$

Define a labeling $f : V(G) \to \{1,2,3,\dots,4n+1\}$ as follows

Let $f(c) = 1, f(u_1) = 3, f(v_1) = 2, f(v_1') = 4$ *and* $f(u_1') = 5.$

$$f(u_i) = 4i, \qquad for\ 2 \le i \le n$$

$$f(v_i) = 4i-1, \qquad for\ 2 \le i \le n, \quad i \not\equiv 1(mod\ 3)$$

$$f(u_i') = 4i-2, \qquad for\ 2 \le i \le n$$

$$f(v_i') = 4i+1, \qquad for\ 2 \le i \le n, \quad i \not\equiv 1(mod\ 3)$$

$$f(v_i) = 4i+1, \qquad for\ 4 \le i \le n, \quad i \equiv 1(mod\ 3)$$

$$f(v_i') = 4i-1, \qquad for\ 4 \le i \le n, \quad i \equiv 1(mod\ 3)$$

Clearly,

$$\gcd\big(f(c), f(u_i)\big) = 1, \qquad for\ 2 \le i \le n\ .$$

$$\gcd\big(f(c), f(u_i')\big) = 1, \qquad for\ 2 \le i \le n\ .$$

$$\gcd\big(f(u_i), f(v_i)\big) = \gcd(4i, 4i-1) = 1, \quad for\ 2 \le i \le n$$

$$\gcd\big(f(v_i), f(u_i')\big) = \gcd(4i-1, 4i-2) = 1, \quad for\ 2 \le i \le n$$

$$\gcd\big(f(u_i), f(v_i')\big) = \gcd(4i, 4i+1) = 1, \quad for\ 2 \le i \le n$$

$$\gcd\big(f(v_i), f(v_{i+1})\big) = \gcd(4i-1, 4i+3) = 1, \quad for\ 1 \le i \le n-1$$

as these two numbers are odd and difference is 4.

$$\gcd\big(f(v_i), f(v_{i+1}')\big) = \gcd(4i-1, 4i+5) = 1 \qquad if\ \ i \not\equiv 1(mod\ 3)$$

$$\gcd\big(f(v_i), f(v_{i+1}')\big) = \gcd\ (4i+1, 4(i+1)+1)$$

$$= \gcd(4i+1, 4i+5) = 1 \qquad if\ i \equiv 1(mod\ 3)$$

$$\gcd\big(f(v_i'), f(v_{i+1})\big) = \gcd(4i+1, 4i+3) = 1 \qquad if\ i \not\equiv 1(mod\ 3)\ for\ 2 \le i \le n-1$$

as these two numbers are consecutive odd.

$$\gcd\big(f(v_1), f(v_n')\big) = \gcd\ (2, 4n+1) = 1, \ \gcd\big(f(v_1), f(v_n)\big) = \gcd\ (2, 4n-1) = 1,$$

$$\gcd\big(f(v_1'), f(v_n)\big) = \gcd(4, 4n-1) = 1$$

Then f is a prime labeling.

Thus G is a prime graph.

Theorem 2.6

The graph obtained by duplicating all the vertices of the star $S_n = K_{1,n}$ is a prime graph.

Proof:

Let $V(S_n) = \{c, v_1, v_2, \dots, v_n\}$

$E(S_n) = \{cv_i \,/\, 1 \le i \le n\}$

Let G be the graph obtained by duplicating all the vertices of the star $S_n = K_{1,n}$.

Let $v_1', v_2', \dots, v_n'$ and c' be the new vertices of G by duplicating $v_1, v_2, \dots, v_n$ and c respectively.

Then $V(G) = \{c, c', v_1, v_2, \dots, v_n, v_1', v_2', \dots, v_n'\}$

$E(G) = \{cv_i, c'v_i, cv_i' / \ 1 \le i \le n\}$

$|V(G)| = 2n + 2 \ and \ |E(G)| = 3n.$

Define a labeling $f : V(G) \to \{1, 2, \dots, 2n + 2\}$

$f(c) = 1, \quad f(c') = 2,$

$f(v_i) = 2i + 1, \quad for \ 1 \le i \le n$

$f(v_i') = 2i, \quad for \ 1 \le i \le n$

Then $\gcd(f(c), f(v_i)) = \gcd(1, 2i + 1) = 1, \quad for \ 1 \le i \le n$

$\gcd(f(c'), f(v_i)) = \gcd(2, 2i + 1) = 1, \quad for \ 1 \le i \le n$

$\gcd(f(c), f(v_i')) = \gcd(1, 2i) = 1, \quad for \ 1 \le i \le n$

Then f is a prime labeling.

Thus G is a prime graph.

EXAMPLES

Illustration of 2.1

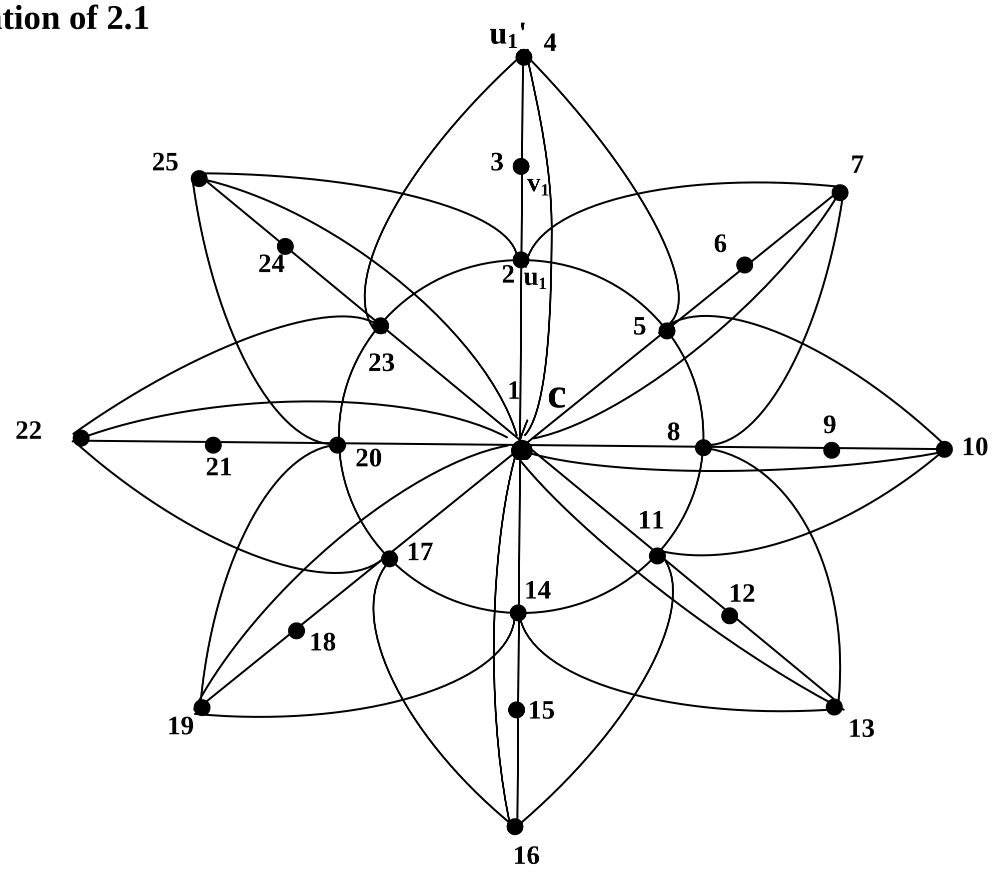

Figure 1. Prime Labeling of duplication of all the rim vertices of Helm H_8

Illustration of 2.2

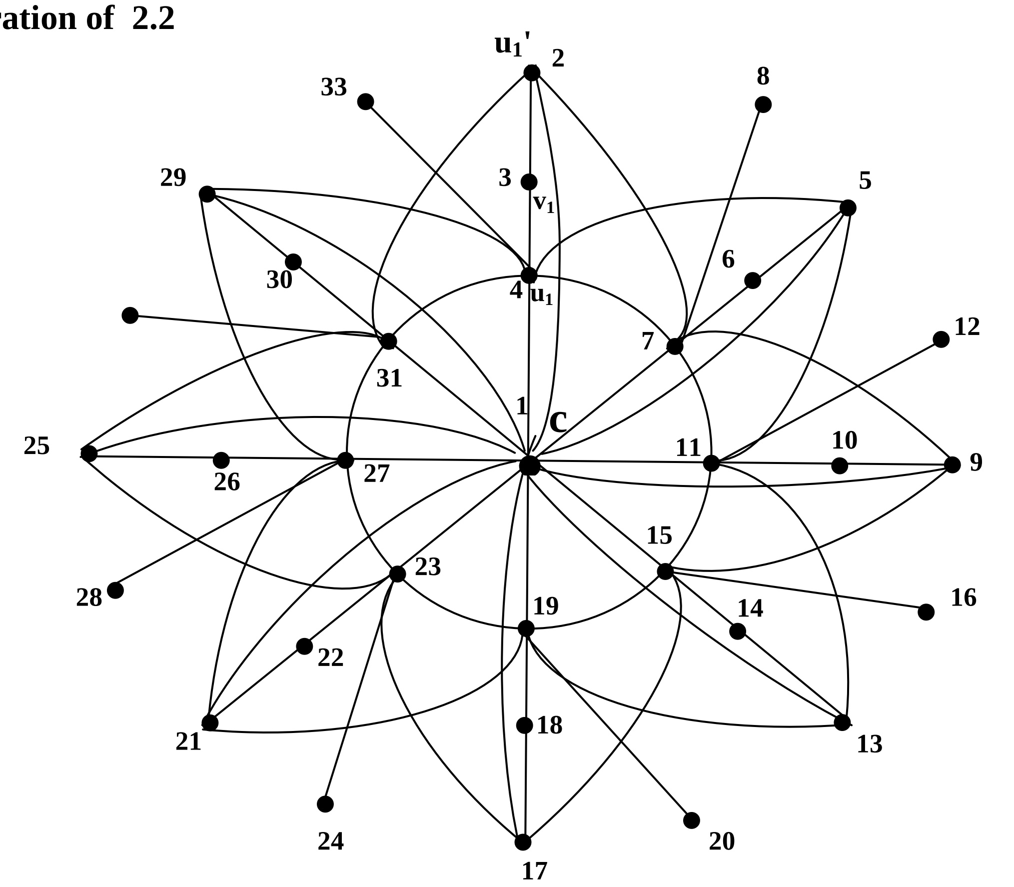

Figure 2. Prime Labeling of duplication of all the vertices of Helm H_8

Illustration of 2.3

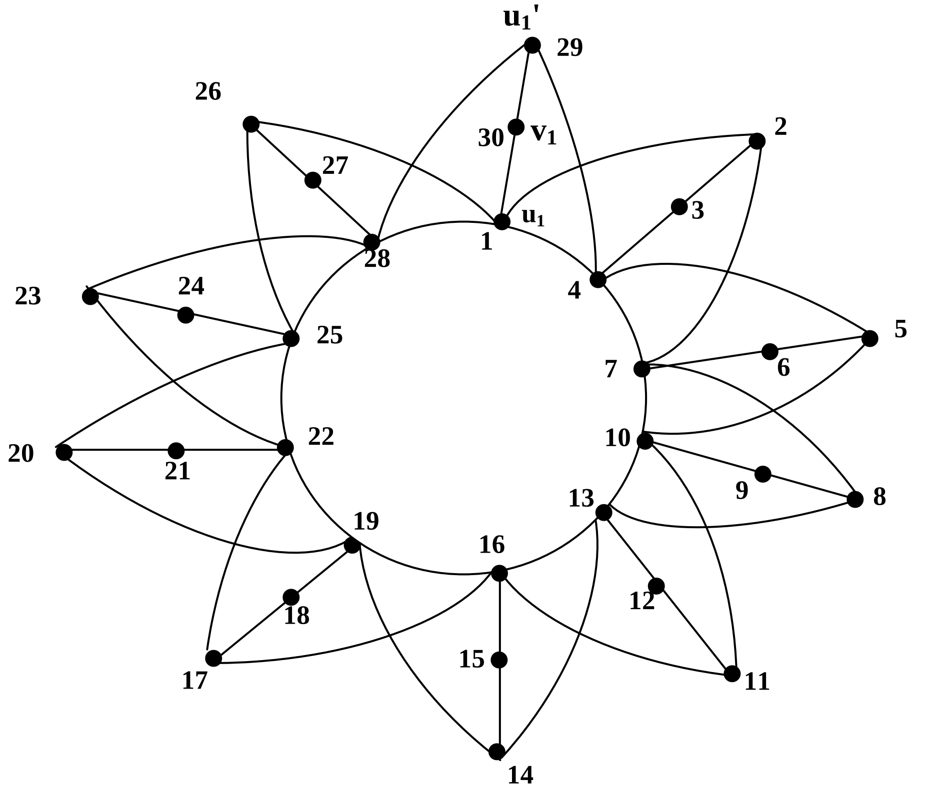

Figure 3. Prime Labeling of duplication of all the rim vertices of crown C_{10}^{*}

Illustration of 2.4

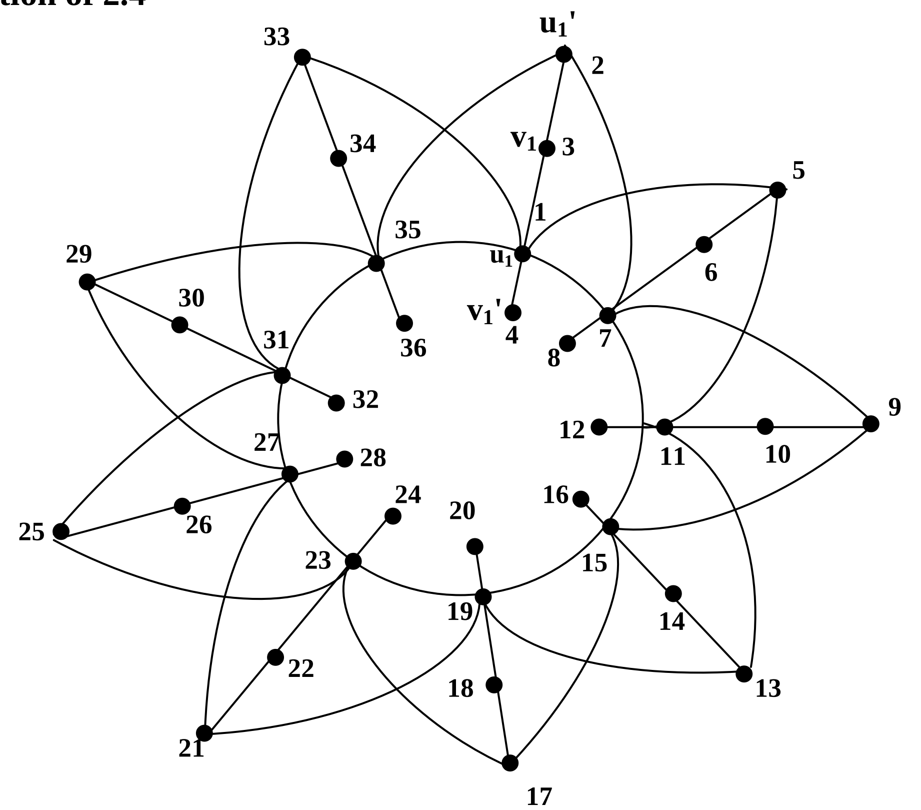

Figure 4. Prime Labeling of duplication of all the vertices of crown C_9^*

Illustration of 2.5

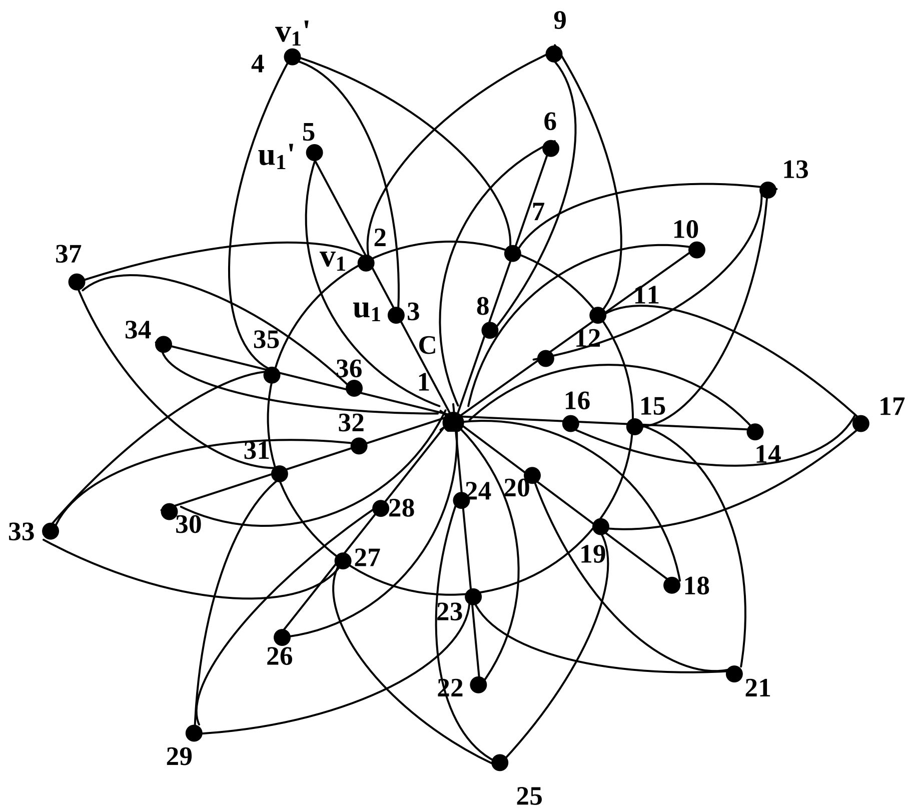

Figure 5. Prime Labeling of duplication of all the vertices of Gear G_9

3. CONCLUSION

Labeled graph is the topic of current due to its diversified application. We investigate six new results on prime labeling. It is an effort to relate the prime labeling and some graph operations. This approach is novel as it provides prime labeling for the larger graph resulted due to certain graph operations on a given graph.

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