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On Prime Labeling Of Lotus Graph, Kite Graph And Hn ʘ K1 Graph

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ABSTRACT

The notion of a prime labeling originated with Entringer and was introduced in a paper by Tout, Dabboucy and Howalla (1982). A graph with vertex set V is said to have a prime labeling if it its vertices are labeled with distinct integers 1, 2, ………..|V| such that for each edge uv the labels assigned to u and v are relatively prime. It is conjectured that all trees have a prime labeling. So far there has been little progress towards proving this conjecture. Among the classes of trees known to have prime labeling are : paths stars, caterpillars, complete binary tress, spiders, olive trees, all trees of order up to 50, palm trees, banana trees and binomial trees.

In this work, we exhibit the Prime labeling of Lotus graph, Kite graph and Hn ʘ K1 graph.

Key words: Lotus graph, Kite graph, Hn ʘ K1,Prime labeling, Prime graph

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Preliminaries:

Definition 1

Prime Labeling

Let G = (V(G); E(G)) be a graph with p vertices. A bijection f : V(G) → {1, 2,....... p} is called a prime labeling if for each edge

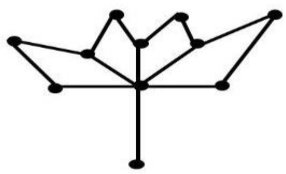
e = uv, gcd (f (u), f (v)) = 1:

A graph which admits prime labeling is called a prime graph.[1,2,3]

Definition 2

A graph is obtained from shell graph by adding a vertex in between each pair of adjacent vertices on the cycle and adding an edge is apex and two or more chords is known as Lotus graph.[5]

Example n= 4 Petals



Lotus graph

Definition 3

An (n, t) - kite is a cycle of length n with a t – edge path attached to one vertex. In particular, the (n, 1) – kite is a cycle of length n with an edge attached to one vertex (n,1) – kite is also known as flag Fln

Example:

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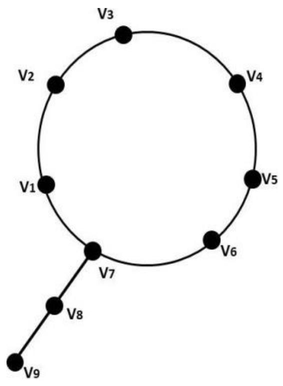


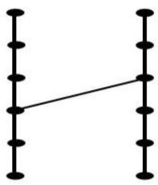
Kite graph

Definition 4

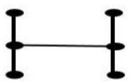
The H- graph of path P_n is the graph obtained from two copies of P_n with the vertices $V_1,V_2,V_3,\ldots\ldots V_n$ and $U_1,U_2,U_3,\ldots\ldots U_n$ by joining the vertices $V_{n+1/2}$ and $U_{n+1/2}$ if n is odd and $V_{n/2+1}$ and $U_{n/2}$ if n is even.[4]

Example:

H graph



H 3 graph



H – graph

Main results

Theorem1:

The Lotus graph admits prime Labeling.

Proof:

Let us consider, the Lotus graph has 4n+5 vertices (where n = 1, 2, 3 …k) and 8+3n edges, and n be a pair of petals, where $n \geq 1$.

U_0 be the middle most vertex.

$U_1U_2U_3\ldots.U_{n-1}$ be the petal vertices.

U_n be the pendent vertex.

f (U_0) = 1

f (U_i) = i for all i = 2 to n-1

f (U_n) = maximum odd number.

Hence the Lotus graph is a prime graph

Illustration 1

Put n=3 petals, the Labeling has to be given by

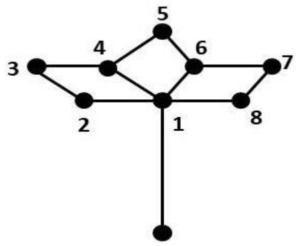


Figure1

and for n=5 petals, the lotus graph becomes

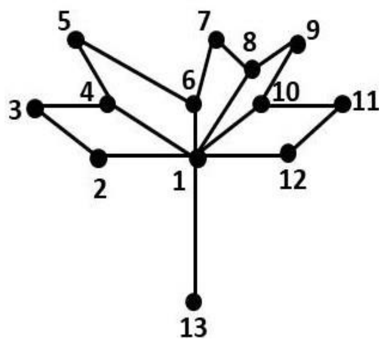


Figure 2

Theorem 2:

For (n≥3), the graph Hn ʘ K1, is a prime graph.

Proof:

Let G be the graph Hn ʘ K1 (n≥3) with the vertices $U_1U_2U_3\ldots U_n$ and $V_1V_2V_3\ldots.V_n$.

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Let U'_i and V'_i be the pendant vertices at U_i and V_i respectively, where i = 1,2,3,….n and let the edges be $E= E_1UE_2UE_3$,

Where $E_1 = \{U_iU_{i+1},V_iV_{i+1}\ /\ 1\le i\le n-1\}$

$E_2 = \{U_{(n+1/2)}\ V_{(n+1/2)}\quad /\ n$ is odd

$\{U_{(n/2)+1}\ V_{(n/2)+1}\quad /\ n$ is even

$E_3 = \{UiU'i,ViV'i\ /\ 1\le i\le n\ \}$[7]

Then |V (G)| = 4n and |E (G)| = 4n-1,

Let the function f: V → {1, 2, 3 …4n} be defined as follows.

Case i: when n is odd

f (U_i) = 2i-1 , for i = 1 to n

f (U'_I) = 2i , for all i = 1 to n

f (V_i) = 2i – 1 , for i = n+1 to k

f(V'_I) = 2i , for i=n+1 to k

Example:

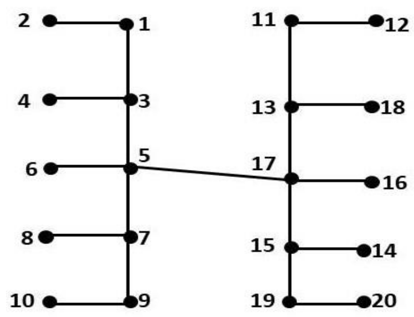

Figure 3

Case ii: when n is an even

f (U_i) = 2i – 1 ,for i = 1 to n

f (U'_I) = 2i , for i = n+1 to k

f (V_i) = 2i -1 ,for i = 1 to n

f(V'_i) =2i , for i= n+1 to k,

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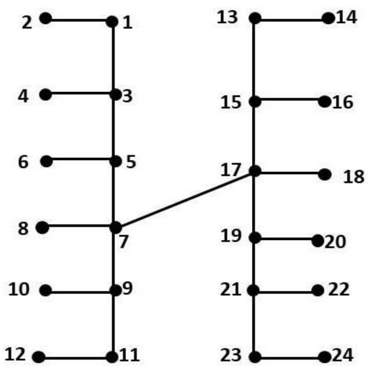
Example:



Theorem 3:

The (m, 2) – kite is prime graph for all m ≥ 3.

Proof:

Let V be the vertex set and E be the edge set of (m, 2) kite. Then |V | = | E | = m+2.

Let e_1, e2, e3…e_n be the cycle vertices of the kite.e'_1, e'2, and e'3….e'_n be the kite vertices.

Define a map f: V→ {1, 2, 3…n,n+1,n+2,n+3….n+k} as follows,

(i) $f(e_i) = i$ for i= 1 to n

(ii) $f(e'_i) = i+1$ for i= n to k

Illustration

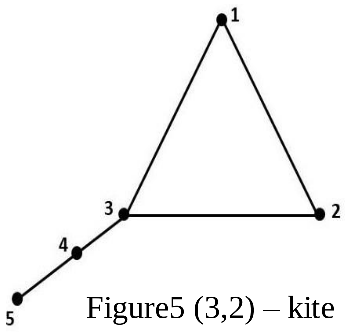


Figure5 (3,2) – kite

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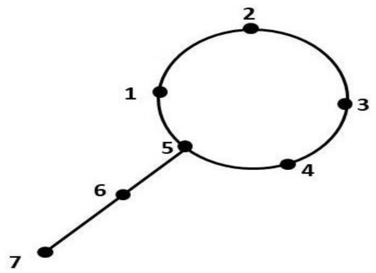

Figure 6 (5,2) kite

Similarly,

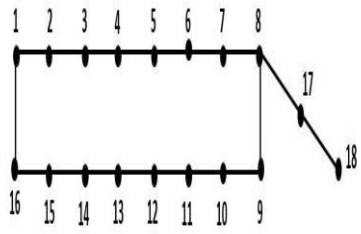

Figure7(16,2) kite

Conclusion:

We have presented the prime labeling of certain classes of graphs like Lotus Graph, Kite graph and Corona graph.

But prime labeling is very difficult to generalize due to the nature of the prime numbers.

It is of interest to study further Product cordial labeling, Cordial labeling, Harmonious labeling etc.,

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