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Q(A) – Balance Edge Magic Graphs

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ABSTRACT
In this paper Q(a)- BEM graph is discussed the following graphs are Cycle graph, Ladder graph, Windmill graph and Gear graph. If G is a (p,q)- graph in which the edges are labeled 1,2,3,…..q so that the vertex sums are constant mod p, then G is called an Edge-Magic graph (in short, EM graph).

Keywords: Edge magic, balance edge magic graph , Q(a)- balance edge magic graph, Cycle graph, Ladder graph, Gear graph.

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I. INTRODUCTION

The first paper in graph theory was written by Euler in 1736 when he settled the famous unsolved problem of his day, known as Konigsberg bridge problem. In 2007 Sin-Min Lee and Thomas Wong and Sheng-Ping Bill Lo introduced two types of magic labeling on the Q(a)-Balance Edge-magic Graphs and Q(a)- Balance Super Edge –magic Graphs and proved several conjectures[1]. The labeling to be edge-magic if the sum of all labels associated with an edge equals a constant independent of the choice of edge, and vertex-magic if the same property holds for vertices.

II. PRELIMINARIES

2.1Magic graph[2][3][4]: A magic graph is a graph whose edges are labeled by positive integers, so that the sum over he same independent of the choice of vertex or It is a graph that has such a labelling.

2.2.Edge-magic graph[5][6][7][8]: A graph G is a (p, q)- graph in which the edges are labeled by 1,2,3,…….q so that the vertex sum are constant, mod p, than G is called an edge-magic graph **(**for simplicity we denote EM).

2.3. Q(a)- Balance Edge Magic[9][10] [11] [12]: A(p, q)- graph G in which the edges are labeled by Q(a) so that the vertex sums mod p is a constant, is called Q(a)- Balance Edge Magic (in short, **Q(a)-BEM**), where For a≥1, we denote

$$Q(a) = \begin{cases} \{\pm a, \ldots\ldots\ldots\ldots \pm(a-1+q/2)\} \text{ , if q is even,} \\ \{0, \pm a, \ldots\ldots\ldots\ldots \pm(a-1+q-1/2)\} \text{ if q is} \end{cases}$$

2.4. Cycle graph : A cycle graph C_n, sometimes simply known as an n-cycle is a graph on n nodes containing a single cycle through all nodes. Cycle graphs (as well as disjoint unions of cycle graphs) are two-regular.

2.5. Ladder graph : The n-ladder graph can be defined as P_2*P_n, where P_n is a path graph .It is therefore equivalent to the $2\times n$ grid graph. The ladder graph is named for its resemblance to a ladder consisting of two rails and n rungs between them.

2.5. Gear graph: The gear graph, also sometimes known as a bipartite wheel graph, is a wheel graph with a graph vertex added between each pair of adjacent graph vertices of the outer cycle.

2.6 Windmill graph: The windmill graph $D_n^{(m)}$ is the graph obtained by taking m copies of the complete graph K_n with a vertex in common (Gallian 2011, p. 16). The case $n=3$ therefore corresponds to the Dutch windmill graph $D_n^{(m)}$.

III. Q(A)- BALANCE EDGE MAGIC FOR SOME GRAPHS

In this chapter discuss about Q(a)- Balance Edge Magic (BEM) of Cycle graph, Ladder graph and Gear graph.

Q(a)- Balance Edge Magic of Cycle Graph

Theorem 3.1

If the Cycle graph, then is Weak Q(a)- BEM for a=1,2,3,4

Proof :

If n= 3, It suffices to show that Q(a)- BEM for a= 1,2,3,4.

Here q is Odd, figure shows that is strong Q(a)-BEM.

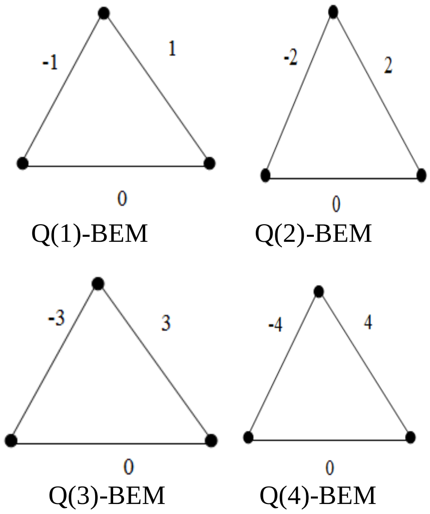

Figure 1

Q(1)- BEM labeling for Cycle graph = { 0,1, -1}
Q(2)- BEM labeling for Cycle graph = { 0,2, -2}
Q(3)- BEM labeling for Cycle graph = { 0, 3,-3}
Q(4)- BEM labeling for Cycle graph = { 0, 4,-4}

Q(a)- Balance Edge Magic of Ladder Graph

Theorem 3.2

If G is a Ladder graph, then is strong Q(a)-BEM for a=1,2,3,4

Proof :

If n= 4, It suffices to show that is Q(a)-BEM for a= 1,2,3,4.
Here q is even, figure shows that G is strong Q(a)-BEM

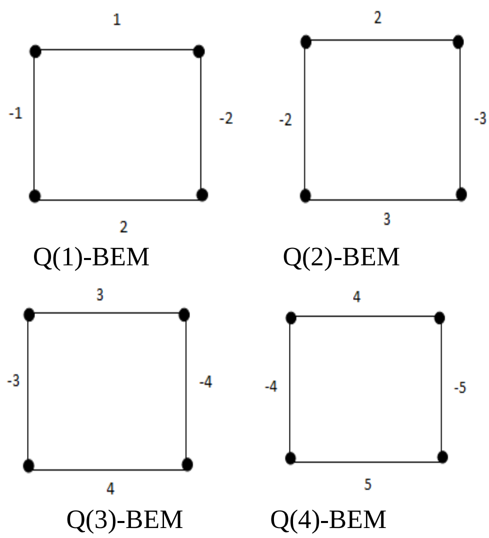

Figure 2

Q(1)-BEM labeling for Ladder graph ={1, -1, 2, 2}
Q(2)-BEM labeling for Ladder graph= { 2, -2, 3,3}
Q(3)-BEM labeling for Ladder graph = { 3, -3, 4,4}
Q(4)-BEM labeling for Ladder graph = { 4, -4, 5,5}

Q(a)- Balance Edge Magic of Gear Graph

Theorem 3.3

If G is a Gear graph, then is weak Q(a)-BEM for a=1,2,3,4

Proof :

If n= 7, It suffices to show that is Q(a)- BEM for a= 1,2,3,4.
Here q is odd, figure shows that G is weak Q(a)-BEM.

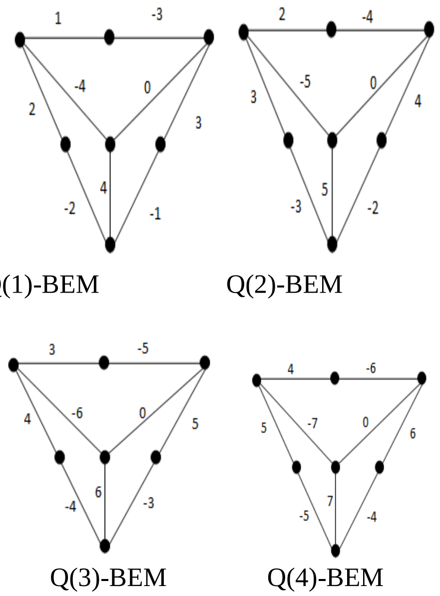

Figure 3

Q(1)-BEM labeling for gear graph = {0, 1, -1, 2, -2, 3, -3,4,-4}
Q(2)- BEM labeling for gear graph = {0, 2, -2, 3, -3, 4,-4,5,-5}
Q(3)- BEM labeling for gear graph = {0, 3, -3, 4,-4, 5,-5, 6,-6}
Q(4)- BEM labeling for gear graph = {0, 4,-4,5,-5, 6, -6, 7,-7}

Q(a)- Balance Edge Magic of Windmill Graph

Theorem 3.4

If the Windmill graph W_5 is weak Q(a)- BEM for a=1,2,3,4

Proof

If n= 5,It suffices to show that W_5 is Q(a)-BEM for a= 1,2,3,4
Here q is even, figure shows that $W_5$is weak Q(a)-BEM.

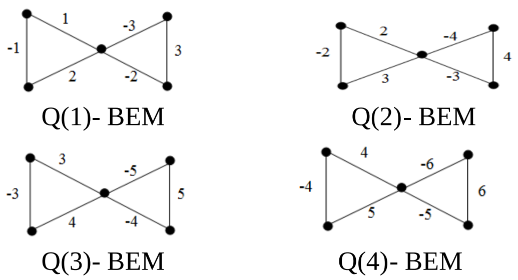

Figure 4

Q(1)- BEM labeling for Windmill graph = { 1, -1, 2, -2, 3, -3}
Q(2)- BEM labeling for Windmill graph = { 2, -2, 3, -3, 4, -4}
Q(3)- BEM labeling for Windmill graph = { 3, -3, 4, -4, 5, -5}

Q(4)- BEM labeling for Windmill graph = { 4, -4, 5, -5, 6, -6}

IV. CONCLUSION

In this research the results has been found about Q(a)- Balance Edge magic labeling. Every Edge magic graphs are also Q(a)- Balance Edge magic graphs. This dissertation discussed about the Q(a)- Balance Edge magic graph and the new results developed through the following graphs like Cycle graph, Ladder graph and Gear graph. Q(a)-Balance Edge magic Graph discussed their applications in various fields such as technologies, communication networks, astronomy, Circuit design and database management will be developed on future purpose.

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