International Journal of Engineering Technology, Management and Applied Sciences

www.ijetmas.com August 2014, Volume 2 Issue 3, ISSN 2349-4476

A STUDY ON NUMBER OF EDGES IN THE CENTRAL GRAPH OF THE DUTCH-WINDMILL GRAPH D_3^m

Sameerali Pilathottathil*, S.Uma Maheswari #.

* M.Phil. Scholar , Department of Mathematics , C.M.S. College of Science and Commerce Coimbatore, Tamilnadu-641049, India.

Assistant Professor , Department of Mathematics , C.M.S. College of Science and Commerce Coimbatore, Tamilnadu-641049, India.

ABSTRACT

In this paper, we have discussed the number of edges contained in the central graph of the Dutch-windmill graph and derived an equation for finding the number of edges in the central graph of the Dutch-windmill graph.

GENERAL TERMS

Dutch-windmill graph and Central graph of Dutch-windmill graph are denoted by D_3^m and C (D_3^m) respectively.

KEY WORDS

Dutch-windmill graph, Central graph.

1. INTRODUCTION

Let G be a finite undirected graph with no loops and multiple edges. For the graph G we do an operation on G, by subdividing each edge exactly once and joining all the non-adjacent vertices of G. The graph obtained by this process is called the central graph [1,2] of G denoted by C(G).

2. DUTCH-WINDMILL GRAPH

THEOREM.2.1

The number of edges contained in the central graph of the Dutch-windmill Graph, C(D_3^m) is 2m(m+2).

Proof:

The edges of central graph of a graph is formed by the following two steps:

Step 1: By subdividing edges of G.

Step 2: By joining non-adjacent vertices of G.

Consider the Dutch-windmill graph D_3^m formed by m copies of the cycle C_3 with a vertex in common.

Consider step 1,

. Initially there are 3m edges in D_3^m .If we subdivide them once , then the number of edges will become 2×3m = 6m edges. Therefore the number of edges formed by subdividing edges of D_3^m is 6m.

Next consider step 2,

Note that D_3^m contains 2m vertices other than the common vertex. The common vertex is already adjacent to every other vertices. Therefore we are left with these 2m vertices. We have to join every pair of these 2m vertices by a straight line. This can be done in $\binom{2m}{2}$ ways. But in G, m vertices are already joined (ie. exactly one vertex in each copy of the cycle C_3). Thus the number of non-adjacent vertices in G is $\binom{2m}{2} - m$.

Therefore total number of edges contained in the central graph of the Dutch–windmill graph D_3^m ,

$$= 6m+\binom{2m}{2}-m$$

$$= \binom{2m}{2} + 5m$$

$$= \frac{(2m)!}{2!(2m-2)!} + 5m$$

$$= \frac{2m(2m-1)(2m-2)!}{2!(2m-2)!} + 5m$$

$$= \frac{2m(2m-1)}{2} + 5m$$

$= 2m^2+4m$.

$= 2m(m+2)$.

3.EXAMPLES.

Example 1:

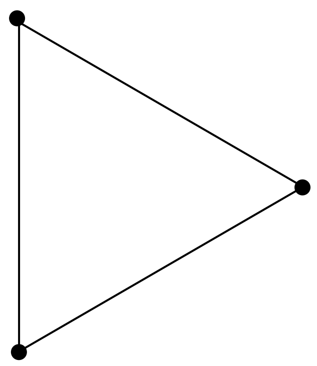


Figure 1(a): D_3^1

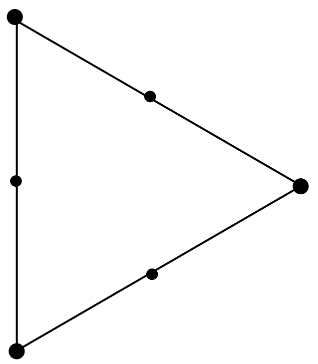


Figure 1(b): C (D_3^1)

In figure 1(b),

Number of edges formed by subdivision = 6 = 6m.

Number of edges formed by joining non-adjacent vertices of G,

= 0

www.ijetmas.com August 2014, Volume 2 Issue 3, ISSN 2349-4476

$$= \binom{2}{2} - 1 .$$

$$= \binom{2m}{2} - m .$$

Total Number of edges in C (D_3^1) = 6 = 2m(m+2).

Example 2:

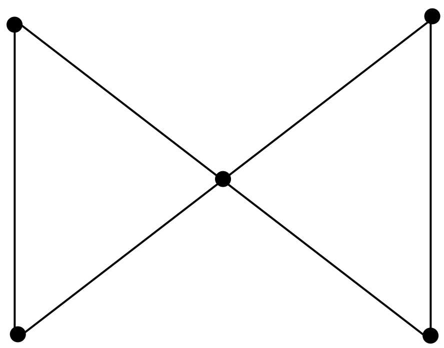


Figure 2(a): D_3^2

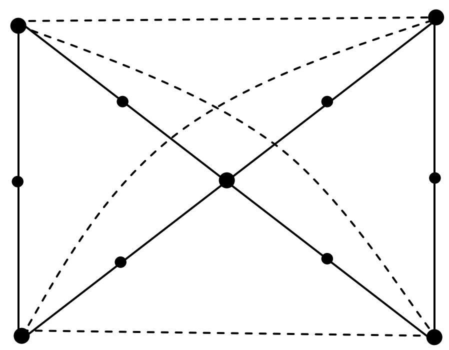


Figure 2(b): C(D_3^2)

In figure 2 (b),

Number of edges formed by subdivision = 12 = 6m.

Number of edges formed by joining non-adjacent vertices of G,

$$= 4$$

$$= \binom{4}{2} - 2 .$$

$$= \binom{2m}{2} - m .$$

Total Number of edges in C (D_3^2) = 16 = 2m(m+2).

Example 3:

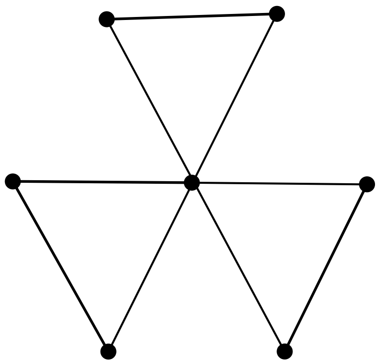


Figure 3(a): D_3^3

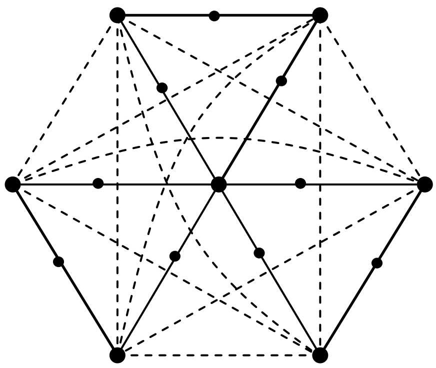


Figure 3(b): $C(D_3^3)$

In figure 3(b),

Number of edges formed by subdivision = 18 = 6m.

Number of edges formed by joining non-adjacent vertices of G,

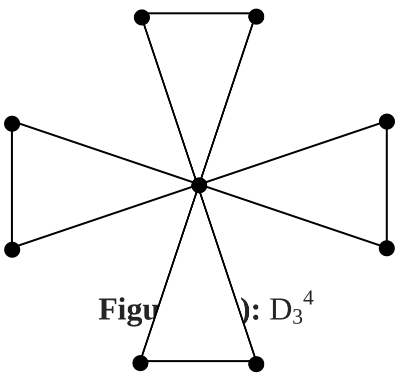
$$= 12$$

$$= \binom{6}{2} - 3 .$$

$$= \binom{2m}{2} - m .$$

Total Number of edges in $C\,(D_3^3)$ = 30 = 2m(m+2).

Example 4:



Figu): D_3^4

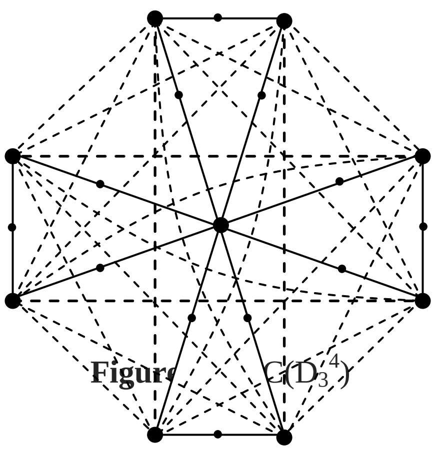


Figure $C(D_3^4)$

In figure 4(b),

Number of edges formed by subdivision = 24 = 6m.

Number of edges formed by joining non-adjacent vertices of G,

$$= 24$$

$$= \binom{8}{2} - 4 .$$

$$= \binom{2m}{2} - m .$$

Total Number of edges in $C(D_3^4)$ $= 48 = 2m(m+2)$.

4.CONCLUSION

In this present study, we have derived an equation for finding the number of edges in the central graph of a Dutch-windmill graph. That is, the number of edges contained in the central graph of the Dutch-windmill graph, $C(D_3^m)$ is $2m(m+2)$.

5.REFERENCES

[1]. Dr. K. Thilakavathi, Mr. P.Shanas Babu" A note on Acyclic Coloring of Central Graphs"- International journal of computer Applications(0975-8887)Volume 7- No.2, September2010.

[2].Vivin J.Vernold, M. Venkatachalam and Ali M.M. Akbar " A note on Achromatic Coloring of Star Graph Families", Filomat 23:3 (2009), 251-255. DOI:10.2298/FIL0903251V.