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AN ELABORATE STUDY OF GRAPHOIDAL COVERING NUMBER OF A GRAPH

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Abstract:

A Graphoidal cover of a graph *G* = (*V,E*) is a collection of paths in G such that (a) every path has at least two vertices (b) every vertex of *G* is an internal vertex of at most one path, and (c) every edge of *G* is in some path. The graphoidal covering number (*G*) of G is defined to be the minimum cardinality of a graphoidal cover of G. In this thesis we determine the graphoidal covering numbers of trees, complete bipartrite graphs. Hamiltonian graphs and regular graphs.

Key Words: Vertex, Vertices, Grpahoidal & Trees

Introduction:

Graph Theory is one of the most important and efficient branches in Mathematics. Graph Theory as a Mathematical discipline was created by Euler in his famous discussion of the Koning – berg bridge problem. Then a number of popular puzzle problems could be formulated directly in terms of graphs. There are applications of Graph theory to some areas of Physics, Chemistry, Computer Science, Operation Research, Electrical Engineering, civil engineering, genetics and economics. The present decade have witnessed as a unique improvement of Graph theory which is the last ten to two tonal years has blossomed out into a new period of intense activity and many of them eager to obtain a new type and its properties.

Basic Definitions and Results:

Definition: A graph G consists of a pair (V(G) , E(G)) where V(G) is a non-empty finite set whose elements are called points or vertices and E(G) is a set of unordered pairs of distinct elements of V(G). A graph with p points and q lines is called a (p, q) graph.

Example: Let V = {a,b, c, d} with E = {{a,b}, {a,c}, {a,d}}

G = (V, E) is a (4,3) graph. This graph can be represented by the diagram given in figure 1.

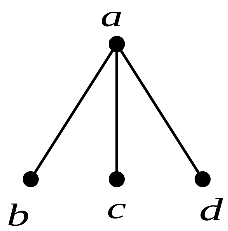


Figure 1

Definition: We also say that the point u and the line x are incident with each other. If two distinct lines x and y are incident with a common point then they are called adjacent lines.

Example: Let V = {1,2,3,4} and E = {{1,2}, {1,3},{1,4},{2,3},{2,4},{3,4}}. This graph is represented by the diagram in figure 2. In the diagram a, b, c, d, e, f represent the edges in E.

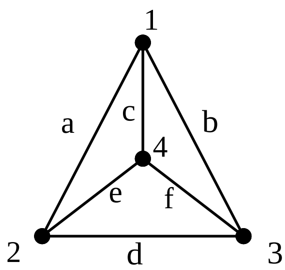


Figure 2

The line b joins the points 1 and 3 and hence the vertices 1 and 3 are adjacent. The line b is incident with 1 as well as 3. The lines b and c are called adjacent lines as they have 1 as a common point.

Definition: Always a graph were any of two distinct points are adjacent is called a complete graph. Then complete graph with the relavant of p points is pointed by K_p .

Example:

K_5:

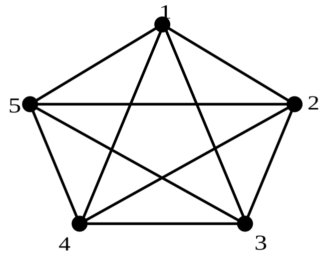


Figure 3

Definition: A graph G is called a bigraph or bipartite graph if V can be partitioned into two disjoint subsets V_1 and V_2 such that every line of G joins as a pointed of V_1 to a point of V_2. (V_1, V_2) is called a bipartition of G. If further G contains every line joining the points of V_1 to the points of V_2 then G is called a complete bipartite graph. If V_1 contains m points and V_2 contains n points the complete bigraph G is denoted by $K_{m,n}$

Example: This is a complete bipartite graph denoted by $K_{3,3}$ with the bipartition (V_1 , V_2) where V_1 = {1,2,3} and V_2 = {4,5,6}.

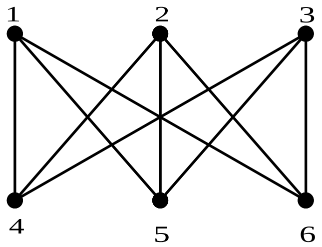


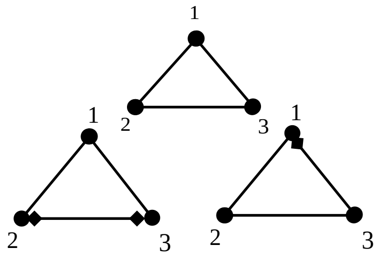
Figure 4

Definition: A graphoidal cover of a graph G = (V, E) is a set ψ of (not necessarily open) paths in G satisfying the following conditions.

- Every vertex of G is an internal vertex of almost, one path in ψ.

Example:

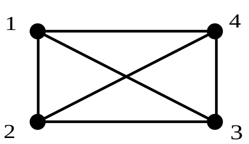
$G(K_3)$ =

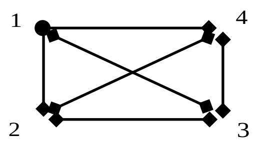


ψ_1 = (2,3)(2,1,3) ψ_2 = (1,2,3,1)

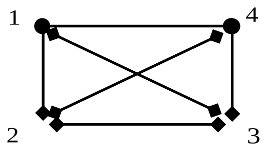
Certain Graphoidal Covers of K_n (n = 4, 5):

$G(K_4)$

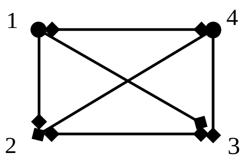




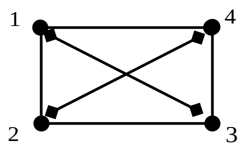
ψ_2 = (2, 1, 4),(2,3)
(2,4) (3,4) (1,3)



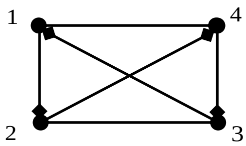
ψ_3 = (2, 1, 4, 3)
(2,3) (2,4) (3,1)



ψ_4 = (2,1,3), (2, 4,3)
(2, 3) (1, 4)

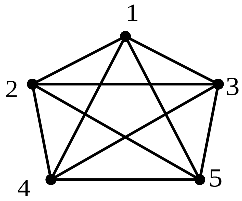


ψ_5 = (1,2,3,4,1)
(1, 3) (2, 4)

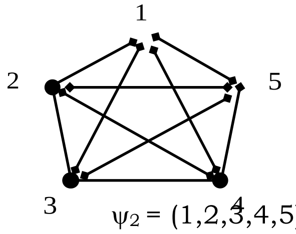


ψ_6 = (2,1,4,3)
(1,3,2,4)

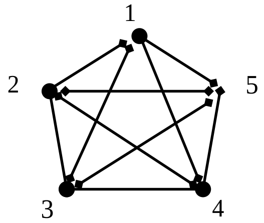
$G(K_5)$



ψ_1 = (1,2,3,4,5) (2,4) (1,3) (2,5) (3,5) (4,1) (1,5)



ψ_2 = (1,2,3,4,5) (2,4) (3,5) (1,4) (2,4) (3,5)



ψ_3 = (1,2,3,4,5) (3,1,5,2) (1,3) (2,5) (4,1,5)

Conclusion:

We have a good pent of the proofs but ψ be a collection of internally edge disjoint paths in G. A vertex of G graph was deliberated as to be an internal vertex of ψ if it is an internal vertex of some path(s) in ψ, otherwise it is called an external vertex of ψ. The count of internal and external vertices of a path P in ψ is called as $i_\psi(P)$; the number of internal vertices which appear exactly once in a path of ψ as $t_1(\psi)$ with max $t_1(\psi) = t_1$; the count of internal vertices were appeared exactly twin in bi paths of ψ by $t_2(\psi)$ and max $t_2(\psi) = t_2$ and the number of external vertices by t_ψ and min $t_\psi = t$.

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