Integrated Intelligent Research (IIR)
International Journal of Computing Algorithm
Volume: 03 Issue: 03 December 2014 Pages: 324-327
ISSN: 2278-2397

Domination Number on Balanced Signed Graphs

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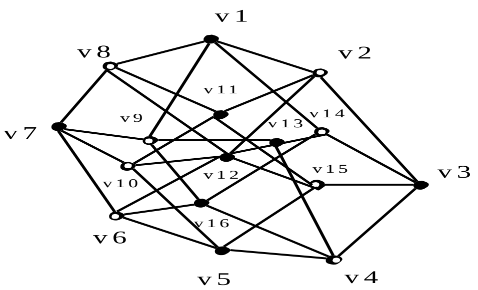
Abstrac: - A signed graph based on F is an ordinary graph *F* with each edge marked as positive or negative. Such a graph is called balanced if each of its cycles includes an even number of negative edges. We find the domination set on the vertices, on bipartite graphs and show that graphs has domination Number on signed graphs, such that a signed graph G may be converted into a balanced graph by changing the signs of *d* edges. We investigate the number *D(F)* defined as the largest *d(G)* such that G is a signed graph based on *F*. If F is the completebipartite graph with t vertices in each part, then $D(f) \leq \frac{1}{2} t^2 - ct^{3/2}$ for some positive constant c.

I. DEFINITION

Hoff man Graph:The Hoffman graph is the bipartite graph on 16 nodes and 32 edges illustrated above that is cospectral to thetesseract graph Q_4 (Hoffman 1963, van Dam and Haemers 2003). Q_4 and the Hoffman graph are therefore not determined by their spectrum. Its girth, graph diameter, graph spectrum, and characteristic polynomial are the same as those of Q_4, but its graph radius is 3 compared to the value 4 for Q_4.In graph *theory*, a dominating set for a graph $G = (V, E)$ is a subset D of V such that every vertex not in D is adjacent to at least one member of D. The domination number $\gamma(G)$ is the number of vertices in a smallest dominating set for G.



‘V’ Denotes the vertices,

‘ ∘ ’ denotes the domination set

D(f) Of$\{V_1,V_2,V_3,V_4,V_5,V_6,V_7,V_8\} = 4$

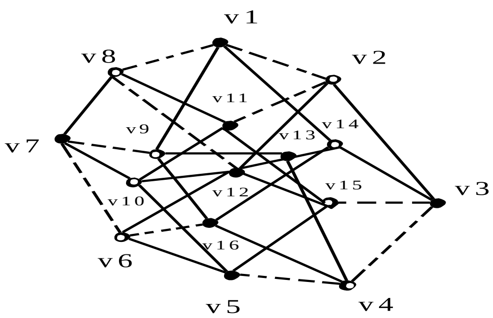


Figure: domination number on balanced signed bipartite e graph

II. ILLUSTRATION

There are 17 possible balanced signed graphs on this hoffman's bipartite graphAccording to the definition, $D(f) \leq \frac{1}{2} t^2 - ct^{3/2}$

Where ‘t’ is number Of vertices t=16

$D(f) \leq \frac{1}{2} (16)^2 - c(16)^{3/2}$

$D(f) \leq \frac{1}{2}(256) - c(64)$

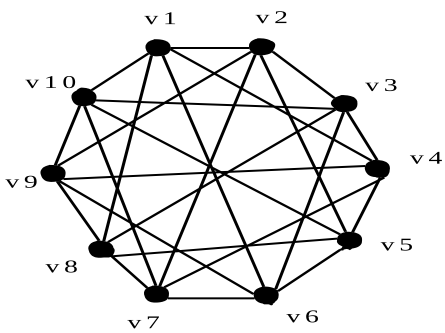
$D(f) \leq 128 - (64)c$ *:- where c is some Positive constant*

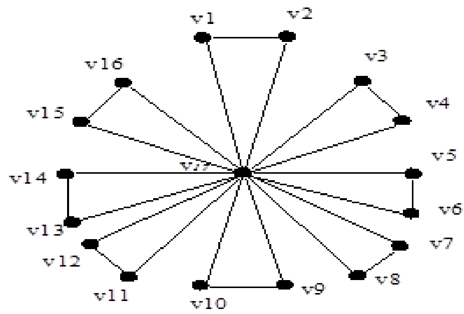
$D(f) \leq 128$ *:- where c is Zero*

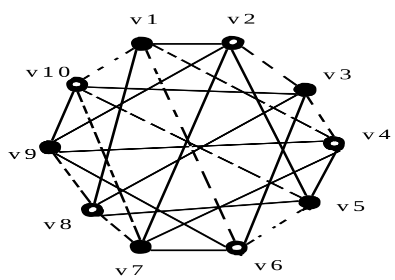
$D(f) \leq 128 - (64)c$ *:- where c is some Negative constant*

Thus the condition satisfies

A complete bipartite graph $K_{n,n}$ is a circulant graph (Skiena 1990, p. 99), Specifically $Ci_{1,3,\ldots,2\lfloor n/2 \rfloor+1}(n)$, where $\lfloor x \rfloor$ is the floor function.







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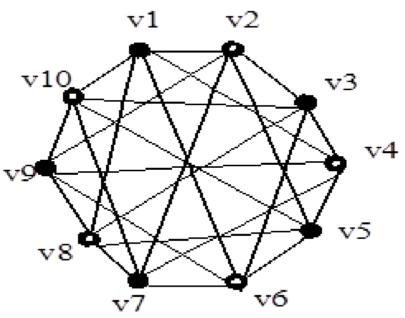


“V’ denotes the vertices of the Graph

○ Denotes the Domination Set

D(f) of { $V_1,V_2,V_3,V_4,V_5,V_6,V_7,V_8,V_9,V_{10}$} =5

There are 21 possible balanced signed graphs on this bipartite graph $K_{10,10}$

According to the definition, $D(f) \leq ½ \, t^2 - ct^{3/2}$

Where ‘t’ is number Of vertices t=40

$D(f) \leq ½ \, (40)^2 - c(40)^{3/2}$

D(f)≤ 800 - c(252.98) :- where c is some Positive constant

D(f)≤ 800 :- where c is Zero

D(f)≤ 800 – (252.98)c :- where c is some Negative constant

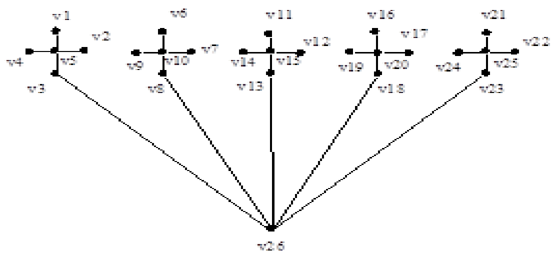
Thus the condition satisfies

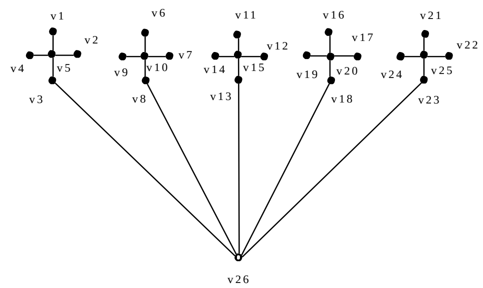
The Following Graphs are the Single connected domination number Balanced Signed Graphs:

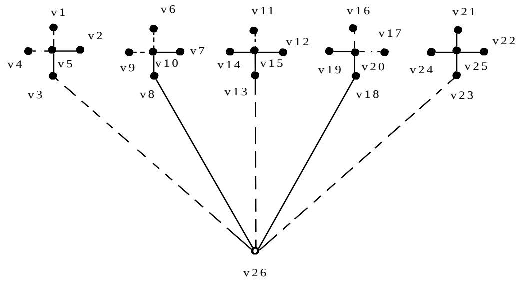
An (n,k) -banana tree, as defined by Chen et al. (1997), is a graph obtained by connecting one leaf of each of *n* copies of an *k* Star Graph with a single root vertex that is distinct from all the stars.

The (*n* , *k*)-banana tree has Rank Polynomial

$R(x) = (1 + x)^{nk}$







“V’ denotes the vertices of the Graph

○ Denotes the Domination Set

There are 14possible balanced singed graphs which could be formed from the above *B(5,5)* graph.

Where ‘t’ is number Of vertices t=26

$D(f) \leq ½ \, (26)^2 - c(26)^{3/2}$

D(f) ≤ 338 – (132.57) *c:- where c is some Positive constant*

D(f)≤ 338 :- where c is Zero

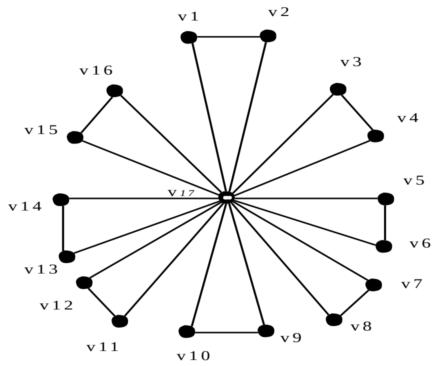
D(f)≤ 338 – (132.57)c :- where c is some Negative constant

Thus the condition satisfies

Friendship Graph:

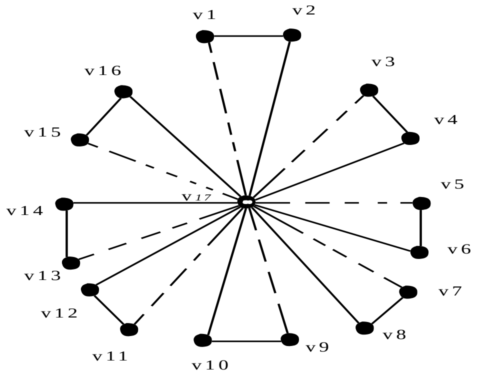
The Friendship Graph is denoted by F_n. Where the below figure is F_8.

Vertices 2n+1, and Edges 3n.



“V’ denotes the vertices of the Graph

○ Denotes the Domination Set



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D(f) of { $V_1, V_2, \ldots\ldots V_{16}$} = 2 and D(f) Of {$V_{17}$}=16

There are 13 possible balanced singed graphs which could be formed from the above F_8 graph.

Where 't' is number Of vertices t=17

$D(f) \le \frac{1}{2} (17)^2 - c(17)^{3/2}$

D(f) ≤ 144.5 - *c*(70.09) *:- where c is some Positive constant*

D(f)≤ 144.5 *:- where c is Zero*

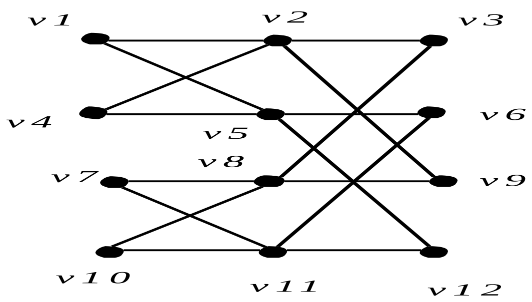
D(f)≤ 144.5 – (70.09)c *:- where c is some Negative constant*

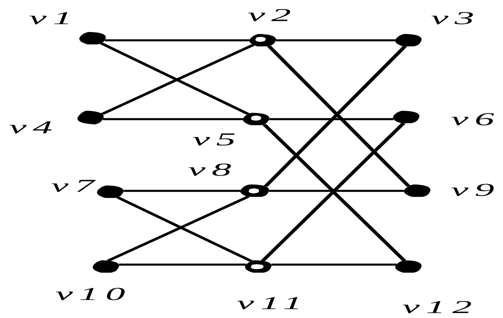
Thus the condition satisfies

The Following are the Twoconnected domination number balanced signed graphs:

Butterfly Networks

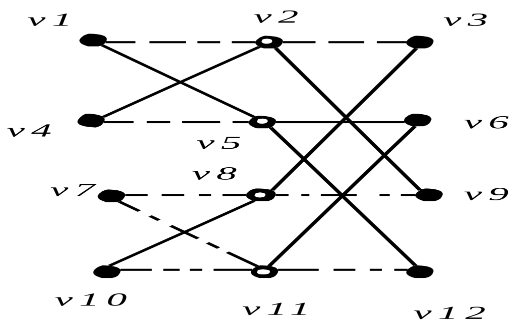
The n-dimensional butterfly graph has 2^n (n+1) vertices and 2^{n+1} n edges.BF (2)





"V' denotes the vertices of the Graph

⭘ Denotes the Domination Set



D(f) of

{$V_1, V_3, V_4, V_6, V_7, V_9, V_{10}, V_{12}$} = 2 and D(f) of { V2,V5,V8,V11} =4

There are 9 possible balanced singed graphs which could be formed from the above BF2 graph.

Where 't' is number Of vertices t=12

$D(f) \le \frac{1}{2} (12)^2 - c(12)^{3/2}$

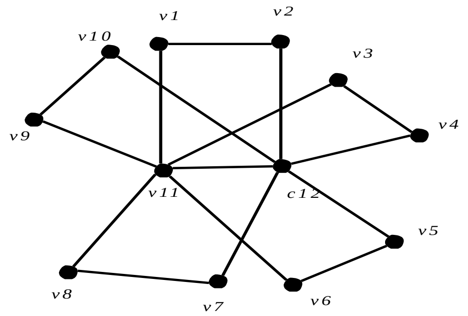
D(f) ≤ 72 – c(41.56) :- where c is some Positive constant

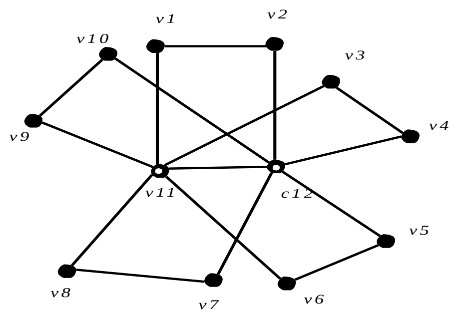
D(f)≤ 72 *:- where c is Zero*

D(f)≤ 72 – (41.56)c *:- where c is some Negative constant*
. Thus the condition satisfies

Book Graph*:*

The m-book graph is defined as the graph Cartesian product $S_{m+1} \times P_2$, where S_m is a star graph and P_2 is the path graph on two nodes. The generalization of the book graph to n "stacked" pages is the (m, n)-stacked book graph

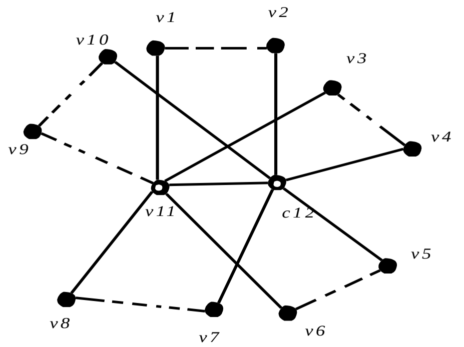




D(f) of { $V_1, V_2, V_3, V_4, V_5, V_6, V_7, V_8, V_9, V_{10}$} = 2 and D(f) of {$V_{11}, V_{12}$}=6

"V' denotes the vertices of the Graph

⭘ Denotes the Domination Set



There are 9 possible balanced singed graphs which could be formed from the above B_5 graph.

Where 't' is number Of vertices t=12

$D(f) \leq \frac{1}{2}(12)^2 - c(12)^{3/2}$

$D(f) \leq 72 - c(41.56)$ *:- where c is some Positive constant*

$D(f) \leq 72$ *:- where c is Zero*

$D(f) \leq 72 - (41.56)c$ *:- where c is some Negative constant*

Thus the condition satisfies

III. CONCLUSION

We have proved that some splitting graphs of Standard graph are with Domination Number on balanced signed graph conditions. We found out that, Banana Tree and Friendship graphs has single Connected domination number on Balanced signed graphs, and Butterfly Network, Book Graph has two connected domination number on Balanced signed graphs. And hence satisfied the conditions of Balanced Signed Bipartite Graph.

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