

Equivalence of $\Psi (G)$, $\Psi_s (G)$ and $\Psi_a (G)$ for the Fan Graph And fish Tail Graph

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ABSTRACT: We present a colouring, star colouring, acyclic colouring of fan graph in this paper and also, equivalence relation between the above mentioned graph by unique way.

KEYWORDS: Chromatic number, star chromatic number, acyclic chromatic number, fan graph

I. INTRODUCTION

All graphs considered here are undirected. In the following definitions the term colouring will be used to define vertex[5] colouring of graphs. A proper colouring of a graph G is a labeling of the vertices of G . Such that no two neighbour in G are assigned the same label [2].

II. PRELIMINARIES AND MAIN RESULTS

Definition 1:-

A star colouring of a graph is a proper colouring such that no path on [4] vertices is 2 coloured. Star chromatic number of a graph G the minimum number of colours which are necessary to star colour G [6]. It is denoted $\psi_s(G)$.

Definition 2 :-

An acyclic colouring is a proper colouring such that no cycle is 2 coloured[1]. a cyclic chromatic number of a graph G the minimum number of colours which are necessary to acyclic colour G , It is defined by $\psi_a(G)$.

Theorem[7]:-

A fan graph F_n for all $n \geq 3$ has chromatic number and acyclic chromatic number of Fan graph is 3[3].

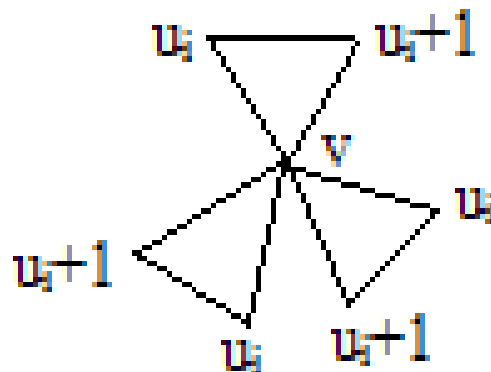
Proof:-

Colouring is done by the following way[3]

i) $f(x)=1$

ii) $f(u_i)=3, i=1,3,\dots,2n-1$

iii) $f(u_i+1)=2, i=1,3,\dots,2n-1$

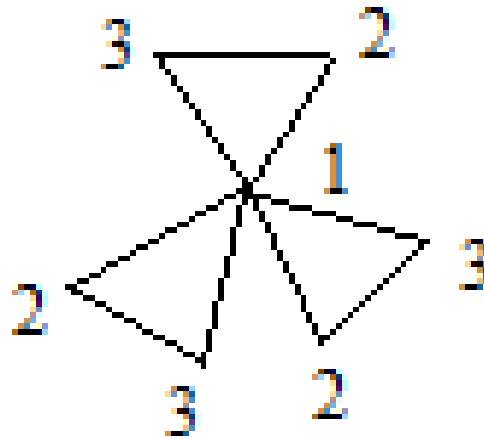


Example:-F3 Fan graph

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If the number of wings will be increases then no changes in the colouring.

Fish tail graph: Let G be the graph with $V(G)=\{u_i, w, v; 1 \leq i \leq n\}$ And $E(G)=\{uv, vw, wu, uu_i, 1 \leq i \leq n\}$
Theorem 2;

A fish tail graph satisfies the equivalence relations between $\psi(G), \psi_a(G),$ and $\psi_s(G)$.

Where $\psi(G)$ is the chromatic number of graph.

Where $\psi_a(G)$ is the acyclic chromatic number of graph.

Where $\psi_s(G)$ is the star chromatic number of graph

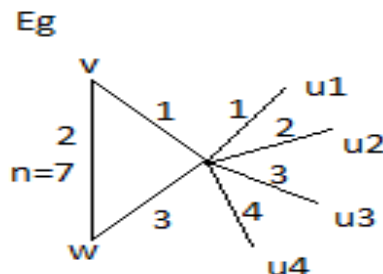
Proof:-

Chromatic number of G ;

Minimum number of colors needed to color the graph G is called coloring. Number of colors used in the graph called Chromatic number of $G[8]$

The coloring of the vertices are given as follows

- i. $f(u)=1$
- ii. $f(v)=2$
- iii. $f(w)=3$
- iv. $f(u_i)=2$



Thus the chromatic number of fishtail graph is 3

$\psi_a(G)$ acyclic chromatic number of Fish tail graph

Acyclic coloring of a graph G is any cycle in graph G is not bicolored.

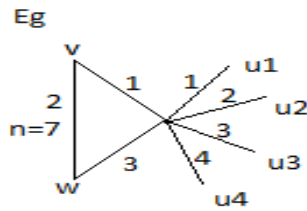
The coloring of the vertices are given as follows[9]

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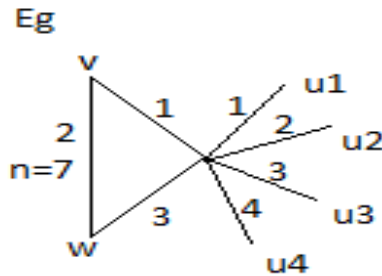
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- i.f(u)=1
- ii.f(v)=2
- iii.f(w)=3
- iv.f(u_i)=2



Thus the acyclic chromatic number of this graph is 3.
star chromatic number of Fish tail graph $\psi_s(G)$.
In a graph G any path of length 3 is not bicolored.
The coloring of the vertices are given as follows

- i.f(u)=1
- ii.f(v)=2
- iii.f(w)=3
- iv.f(u_i)=2



Thus the Star chromatic number of this graph is 3.

III. CONCLUSION

Thus we have proved $\psi(G) = \psi_a(G) = \psi_s(G)$. It is of interest to apply the concepts in directed graphs.

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