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

N.Ramya
Department of Mathematics, Bharath University, Chennai, Tamil Nadu, India

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 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.

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 $G$. It is denoted $\Psi_s(G)$.

Definition 2:- An acyclic colouring is a proper colouring such that no cycle is $2$ coloured. An 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 $n\geq3$ 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) $f(u_i)=3$, $i=1,3,...,2n-1$

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

Example:- F3 Fan graph
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,u_i,w,v;1 \leq i \leq n} And E(G)={uv,vw,wu,u_iu;1 \leq i \leq n}

Theorem 2: A fish tail graph satisfies the equivalence relations between ѱ(G),ѱa(G),and ѱs(G).
Where ѱ(G) is the chromatic number of graph.
Where ѱa(G) is the acyclic chromatic number of graph.
Where ѱs(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
ѱa(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]
i.f(u)=1  
ii.f(v)=2  
iii.f(w)=3  
iv.f(u_i)=2

Thus the ayclic chromatic number of this graph is 3.

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

REFERENCES

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