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On Rainbow Colouring of Some Graphs

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ABSTRACT: A path in an edge coloured graph is said to be a rainbow path if no two edges on the path have the same colour. An edge coloured graph is rainbow connected if there exists a rainbow path between every pair of vertices. The rainbow connectivity with connection number $\gamma_c(G)$ is the smallest number of colours required to edge colour the graph such that graph is rainbow connected. Here we are discussing the rainbow colouring of some graphs.

KEYWORDS: Rainbow Colouring

I. INTRODUCTION

Finite, undirected and simple graphs are considered. The notation and terminology of [1] is followed. The following interesting connectivity measure of a graph has recently attracted the attention of several researchers. An edge coloured graph G is rainbow edge connected if any two vertices are connected by a path whose edges have distinct colours[5]. Clearly, if a graph is rainbow edge connected then it is also connected conversely, any connected graph has a trivial edge colouring, that makes it rainbow edge with distinct colour. Thus the following natural parameter was defined by Chartand et al [2].

Let the rainbow connection of a connection graph G denoted by $\gamma_c(G)$, be the smallest number of colours, that are needed in order to make rainbow edge connected. Let G be a nontrivial connected graph on which an edge colouring $C: E(G) \rightarrow \{1, 2, \dots, n\}$ n belongs to \mathbb{N} , is defined where adjacent edges may be coloured the same[10].

A rainbow colouring using $\gamma_c(G)$ colours is called a minimum rainbow colouring, by definition, if H is a connected spanning sub graph of G , then $\gamma_c(G) \leq \gamma_c(H)$, it is easy[6] to see that $\text{diameter}(G) \leq \gamma_c(G)$ for any connected graph G where $\text{diameter}(G)$ is the diameter of G [2].

Chakraborty et al [3] showed that computing the rainbow connection number of a graph is NP-Hard[9].

II. MAIN RESULTS

Theorem 1

Let G be the graph with $V(G) = \{u, v, w, x, \dots, 1 \leq i \leq n\}$ And $E(G) = \{uv, vw, wu, \dots, 1 \leq i \leq n\}$ which admits rainbow colouring. [4]

Proof:-

The colouring has to be given,

i. $f(uv) = 1$

ii. $f(vw) = 2$

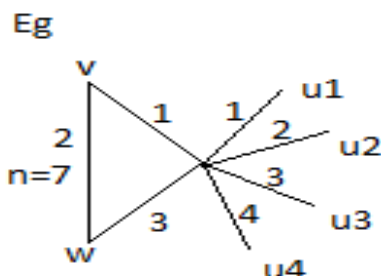
iii. $f(wu) = 2$

iv. $f(u, u_i) = i \quad 1 \leq i \leq n$

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If u_i will be increasing then the rainbow colouring also increases[8].

Theorem 2:-

Let G be the graph with $V(G)=\{u,v,w,x,u_i, 1 \leq i \leq n\}$

And $E(G)=\{uv,vw,wx,xu,uu_i, 1 \leq i \leq n\}$

Proof:-

The colouring has to be given

i. $f(uv)=1$

ii. $f(vw)=2$

iii. $f(wx)=3$

iv. $f(xu)=4$

v. $f(uu_i)=i, 1 \leq i \leq n$



If ' u_i ' will be increases, then the colouring also will be increases[7]

III. CONCLUSION

Rainbow connection number $\gamma_c(G)$ of a connected graph G is the minimum number of colours needed to colour its edges, so that every pair of vertices is connected by at least one path in which no edges are coloured the same. In this paper we have to find the rainbow connection number of above mentioned graphs. It is of interest to extend the concepts of directed graphs.

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