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On Group A-Cordial Labelling of Double Uniform $\left(t_1^{l_1}, t_2^{l_2}\right) - $ Ply

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***Abstract:** Let A denote the multiplicative group $\{1,-1,i,-i\}$. In this paper, we define the notion of double uniform $\left(t_1^{l_1}, t_2^{l_2}\right)$-ply and prove that it is a group A-cordial with each path of length at least 5 by explicitly giving labellings for all the possible cases that arise. Mathematics Subject Classification [2020]: Primary 05C78*

***Keywords:** t-ply; Uniform t-ply; Double t-ply; Double Uniform t-ply; Group A-Cordial Labelling.*

I. INTRODUCTION

Cahit introduced cordial labellings [5] in 1987 as a weakened version of graceful labellings. Different families of cordial labellings and its variations were discussed in [1] [2] and [3].

Definition 1.1. Let $f: V(G) \to \{0,1\}$ be any function. To each edge ab assign the label $|f(a) - f(b)|$. Let $v_f(0), v_f(1)$ denote the number of vertices in G with the labels 0 and 1, respectively. Let $e_f(0), e_f(1)$ denote the number of edges in G with the labels 0 and 1, respectively. The function f is called a cordial labelling if $\left|v_f(0) - v_f(1)\right| \leq 1$ and $\left|e_f(0) - e_f(1)\right| \leq 1$. The graph G is called a cordial graph if it admits a cordial labelling. (See [5]).

Prime labellings were first introduced by Roger Entringer and discussed in a paper by Tout et al. [1].

Definition 1.2. Let $G = (V, E)$ be a graph. A bijection $f: V \to \{1, 2, \dots, |V|\}$ is called a prime labelling if for each $e = \{u, v\} \in E$, we have $\gcd(f(u), f(v)) = 1$. A graph that admits a prime labelling is called a prime graph.

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Motivated by these two labellings, the notion of a group A-Cordial labelling of graphs was introduced by M. K. Karthik Chidambaram, S. Athisayanathan and R. Ponraj (See [8] [9]).

Definition 1.3. Let G be a graph and let A be a group. Let $o(a)$ denote the order of an element $a \in A$. Let $f: V(G) \to A$ be a function. For each edge uv, assign the label 1 if $\gcd(o(f(u)), o(f(v))) = 1$ and 0 otherwise. Let $v_f(a)$ denote the number of vertices in G labeled by f with the element a of the group A. Let $e_f(0), e_f(1)$ denote the number of edges with labels 0 and 1, respectively. The function f is called a group A-cordial labelling if $\left|v_f(a) - v_f(b)\right| \leq 1$ for all $a, b \in A$ and $\left|e_f(0) - e_f(1)\right| \leq 1$. A graph which admits a group A-Cordial labelling is called group A-cordial.

Throughout this paper, the group under consideration will be $A = \{1, -1, i, -i\}$ With respect to multiplying complex numbers.

For the multiplicative group $A = \{1, -1, i, -i\}$ the group A-Cordial labelling for different graphs was considered by Karthik et. al. ([8] [9]) and Boxwala et. al. [4] have obtained a group A-cordial labelling for the uniform t-ply. Further, for the group $A = S_3$, group A-Cordial labelling was studied by B Chandra and R Kala studied cordial labelling ([6], [7]).

Remark 1.4. Note that for the group $A = \{1, -1, i, -i\}$ with respect to the multiplication of complex numbers $o(1) = 1, o(-1) = 2$ and $o(i) = o(-i) = 4$. Thus, an edge uv will be assigned label 1 if at least one of the vertices u or v has been labelled 1. Hence, permuting the labels. $-1, i, -i$ the choice of the vertices among themselves will not affect the edge labelling.

II. PRELIMINARIES

Definition 2.1. (See [1]) A t-ply $P_t(u, w)$ is a graph with t paths, each of length at least two, such that no two paths have a vertex in common except for the end vertices u and w (common to all), which will also be referred to as the source and sink vertices, respectively. We note in passing that. $P_t(u, w)$ denotes an entire family of t-ply graphs with t paths and end vertices u, w.

Definition 2.2. A path on the t-ply graph $P_t(u, w)$ is said to be of type l if the length of the path is congruent to l modulo 4, $l = 1,2,3,4$. We call $P_t(u, w)$ a uniform t-ply of type l if all t paths are of type l i.e., the length of each path is congruent to l modulo 4. We denote such a t-ply by $P_t^l(u, w)$.

Remark 2.3. We observe that in a uniform $t - ply$ of type l, the x^{th} path is of length $n_x + 1$ where $n_x + 1 \equiv l \pmod 4$. Let $n_x + 1 = 4k_x + l$; then $\left|V\left(P_t^l(u, w)\right)\right| = 2 + 4\sum_{x=1}^{t} k_x + (l-1)t$ and $\left|E\left(P_t^l(u, w)\right)\right| = 4\sum_{x=1}^{t} k_x + lt$.

Thus, the number of edges will be odd if and only if both l and t are odd.

Theorem 2.4. Every uniform t-ply with each path of length at least 5 is group A-cordial. (See [4]).

Theorem 2.4 has been proved in [4] by giving an explicit labelling for each of the 12 cases that arose. These 12 labellings are listed in Table I, as they will be useful for proving the main result of this paper. We also remark that, in this table, we state the conditions for cordiality satisfied by the vertex and edge labels for each function in terms of parity. In each row, we choose r such that $t \equiv r(\text{mod } 2)$ or $t \equiv r(\text{mod } 4)$ as the case may be. The relation between the corresponding vertex and edge labels for each label is shown alongside it. Also, we state the conditions for cordiality satisfied by the vertex and edge labels for each function in terms of parity.

A. Additional Labellings Required

In addition to the labellings listed above, we will require two additional labellings in some cases that arise for the graph considered in this paper. These new labellings will be denoted by α_{11}^* (Type A′) and α_{31}^* (Type C′) and they are sumarized in table II. For uniform t-ply the labelling was done in three stages. We now describe these labellings below, and since we will be using the same stages for the additional labellings, we mention the details of the stages below:

Table I: Library of Labellings for Uniform t-ply

l	t	f	$v_f(-1)$	$v_f(1)$	$v_f(i)$	$v_f(-i)$	Relation between $e_f(0)$ and $e_f(1)$
1	$t \equiv 0(\text{mod}2)$	α_{10}	1	1	0	0	$e_{\alpha_{10}}(0) = e_{\alpha_{10}}(1)$
	$t \equiv 1(\text{mod}2)$	α_{11}	1	1	0	0	$e_{\alpha_{11}}(0) + 1 = e_{\alpha_{11}}(1)$
2	$t \equiv 0(\text{mod}4)$	α_{20}	1	1	0	0	$e_{\alpha_{20}}(0) = e_{\alpha_{20}}(1)$
	$t \equiv 1(\text{mod}4)$	α_{21}	1	1	1	0	$e_{\alpha_{21}}(0) = e_{\alpha_{21}}(1)$
	$t \equiv 2(\text{mod}4)$	α_{22}	0	0	0	0	$e_{\alpha_{22}}(0) = e_{\alpha_{22}}(1)$
	$t \equiv 3(\text{mod}4)$	α_{23}	0	1	0	0	$e_{\alpha_{23}}(0) = e_{\alpha_{23}}(1)$
3	$t \equiv 0(\text{mod}2)$	α_{30}	1	1	0	0	$e_{\alpha_{10}}(0) = e_{\alpha_{10}}(1)$
	$t \equiv 1(\text{mod}2)$	α_{31}	0	0	0	0	$e_{\alpha_{31}}(0) = e_{\alpha_{31}}(1) + 1$
4	$t \equiv 0(\text{mod}4)$	α_{40}	1	1	0	0	$e_{\alpha_{40}}(0) = e_{\alpha_{40}}(1)$
	$t \equiv 1(\text{mod}4)$	α_{41}	0	1	0	0	$e_{\alpha_{41}}(0) = e_{\alpha_{41}}(1)$
	$t \equiv 2(\text{mod}4)$	α_{42}	0	0	0	0	$e_{\alpha_{42}}(0) = e_{\alpha_{42}}(1)$
	$t \equiv 3(\text{mod}4)$	α_{43}	1	1	1	0	$e_{\alpha_{43}}(0) = e_{\alpha_{43}}(1)$

We begin by revisiting the definitions of two functions g and h which featured prominently in the various stages.

For any path $P = \{v_1, v_2, \ldots, v_n\}$ of length $n - 1$; we take $n = 4k + m$, where $m = 0,1,2,3$.

Let $g: V(P) \to A = \{1, -1, i, -i\}$ be a map defined as follows:

For $1 \le j \le 4k$,

$$\begin{aligned} g(v_j) &= i, \text{ if } j \equiv 0 \text{ (mod 4)} \\ &= 1, \text{ if } j \equiv 1 \text{ (mod 4)} \\ &= -1, \text{ if } j \equiv 2 \text{ (mod 4)} \\ &= -i, \text{ if } j \equiv 3 \text{ (mod 4)}. \end{aligned}$$

Likewise, we have

$$\begin{aligned} h(v_j) &= i, \text{ if } j \equiv 0 \text{ (mod 4)} \\ &= -1, \text{ if } j \equiv 1 \text{(mod 4)} \\ &= -i, \text{ if } j \equiv 2 \text{(mod 4)} \\ &= 1, \text{ if } j \equiv 3 \text{(mod 4)}. \end{aligned}$$

Observe that g and h label only the first $4k$ vertices on the path.

Consider the uniform t-ply $P_t^l(u,w)$. For $l = 1,3$; we have taken the number of paths t congruent modulo 2 i.e. $t = 2s + r$; where $r = 0,1$. We use the function g on the intermediate vertices $v(x,1), v(x,2), \ldots, v(x,4k_x)$ of the first s paths i.e. for $1 \le x \le s$ and the function h on the intermediate vertices of the paths from $s+1$ to $2s$. For $l = 2,4$; we have taken the number of paths t congruent modulo 4 ; i.e. $t = 4s + r$; where $r = 0,1,2,3$. We use the function g on the first $2s$ paths i.e. for $1 \le x \le 2s$ and the function h on the intermediate vertices of the next 2s paths i.e. $2s < x \le 4s$. This is stage I of the labelling. In this stage, the labels for the vertices and edges are distributed equitably.

There now remain $l - 1$ vertices for labelling on each of the paths that have received labelling in stage I. We label these $2s(l-1)$ or $4s(l-1)$ vertices, as the case may be, in stage II, which is discussed case-wise in [4]. In stage II of the labelling, we ensure that the vertex and edge labels are distributed equitably. We then look at the last r paths that have not yet been labelled. In stage III, we label all vertices on such paths. We label the vertex u with -1 and the vertex w with 1 in all cases. In each case, the resulting labelling for $P_t^l(u,w)$ was denoted by α_{lr}.

We now come to the two specific cases where we require additional labelling as mentioned above. To distinguish the additional labellings from the ones given in [4], we use the superscript $*$ for the same.

Case 1: $l = 1, r = 1$

We label the vertices in stages I and II as before. On the one remaining path, we use the function h. We use the label i for the source vertex instead of our usual -1. We get the labelling α_{11}^*, for which $v_{\alpha_{11}^*}(i) = v_{\alpha_{11}^*}(1) = v_{\alpha_{11}^*}(-1) + 1 = v_{\alpha_{11}^*}(-i) + 1$ and $e_{\alpha_{11}^*}(0) = e_{\alpha_{11}^*}(1) + 1$

Case 2: $l = 3, r = 1$ We first note that there will be at least 3 paths in this case. As in all other cases, we label the start equation u as minus 1 and u as -1 and w as 1. In stage I, we use the labelling g on the first $s - 1$ paths followed by i and 1 on the last two vertices, and we use the labelling h on the next $s - 1$ paths, followed by -1 and $-i$ on the last two vertices on each such path. On the three remaining paths, we use the label g. On one of these paths, we label the last two vertices as $1, i$, on the next with $-1, -i$, and on the last with i and $-i$. This gives us a labelling denoted by $\alpha_{31}{}^*$ for which $v_{\alpha_{31}{}^*}(-1) = v_{\alpha_{31}}(1) =$

$v_{\alpha_{31}}(i) = v_{\alpha_{31}}(-i)$ and $e_{\alpha_{31}}(1) = e_{\alpha_{31}}(0) + 1.$
We describe them in Table II.

Table II: Library of Additional Labellings for Uniform t-Ply

Type	t	f	$v_f(-1)$	$v_f(1)$	$v_f(i)$	$v_f(-i)$	Relation between $e_f(0)$ and $e_f(1)$
A′	$t \equiv 1(\text{mod } 2)$	$\alpha_{11}{}^*$	0	1	1	0	$e_{\alpha_{11}{}^*}(0) = e_{\alpha_{11}{}^*}(1) + 1$
C′	$t \equiv 1(\text{mod } 2)$	$\alpha_{31}{}^*$	0	0	0	0	$e_{\alpha_{31}{}^*}(1) = e_{\alpha_{31}{}^*}(0) + 1$

B. Group A-Cordiality of Double Uniform $(t_1^{l_1}, t_2^{l_2}) -$ Ply

Definition 3.1. A double (t_1, t_2)-ply is a one-point union of two t-ply's $P_{t_1}(u_1, w)$ and $P_{t_2}(u_2, w)$ having only one vertex in common. We denote this double (t_1, t_2)-ply by $P_{t_1}(u_1, w) \odot P_{t_2}(u_2, w)$.
If $P_{t_1}(u_1, w)$ is uniform of type l_1 and $P_{t_2}(u_2, w)$ is uniform of type l_2 then the double (t_1, t_2)-ply is called a double uniform $(t_1^{l_1}, t_2^{l_2})$-ply and will be denoted by $P_{t_1}^{l_1}(u_1, w) \odot P_{t_2}^{l_2}(u_2, w)$.

Theorem 3.2. Every double uniform $(t_1^{l_1}, t_2^{l_2})$-ply with each path of length at least 5 is group A-cordial.

Proof. Consider a double uniform $(t_1^{l_1}, t_2^{l_2}) -$ ply $P_{t_1}^{l_1}(u_1, w) \odot P_{t_2}^{l_2}(u_2, w)$. To prove that this double uniform ply is a group A-cordial, we select an appropriate labelling from amongst the labellings mentioned in Table I for each ply separately. In each of these plys, we apply the labelling from the source to the sink vertex. This will ensure that in all cases w receives the label 1. Let F be the labelling that we choose for $P_{t_1}^{l_1}(u_1, w)$ and G the labelling for $P_{t_2}^{l_2}(u_2, w)$. We then define the labelling for the vertices of $P_{t_1}^{l_1}(u_1, w) \odot P_{t_2}^{l_2}(u_2, w)$ by

$$H(x) = F(x), \text{ if } x \in P_{t_1}^{l_1}(u_1, w)$$
$$= G(x), \text{ if } x \in P_{t_2}^{l_2}(u_2, w)$$

Note that in every labeling that features in Table I, the label for the vertex w is 1; hence $H(w) = F(w) = G(w) = 1$. As w is a shared vertex between the 2 plys, $v_H(1) = v_F(1) + v_G(1) - 1$ and $v_H(y) = v_F(y) + v_G(y)$ for $y = -1, i, -i$. Further, as there is no shared edge between the 2 plys, $e_H(0) = e_F(0) + e_G(0), e_H(1) = e_F(1) + e_G(1)$.
We now break up the proof into two cases as given below:

Case 1: At most one of the two ply's has an Odd Number of edges

In this case, the edge label balance will be achieved automatically by H if the edge label balance is achieved by F and G individually. For this case, we will restrict the choice of F and G to the labellings given in Table I. We can now focus only on achieving the vertex label balance in the double uniform ply by appropriately choosing F and G. To achieve this vertex-label balance, we may have to tweak some of the labellings in Table I; however, the tweaking must not disturb the existing edge-label balance for that labelling.

Before we proceed with the choices, we first note that if we consider the cases based on the values of l_1, t_1, l_2, t_2 and exhibit the choice of labelling in each case, then we will be dealing with a large number of cases. To circumvent this, we observe that there are four distinct types of vertex-label balance achieved by the labellings in Table I. These are given in Table III.

Table III: Balance Relation Between Vertex Labels

Type	Labelling α_{lr}	$v_{\alpha_{lr}}(-1)$	$v_{\alpha_{lr}}(1)$	$v_{\alpha_{lr}}(i)$	$v_{\alpha_{lr}}(-i)$
A	$\alpha_{10}, \alpha_{11}, \alpha_{20}, \alpha_{30}, \alpha_{40}$	1	1	0	0
B	α_{21}, α_{43}	1	1	1	0
C	$\alpha_{22}, \alpha_{31}, \alpha_{42}$	0	0	0	0
D	α_{23}, α_{41}	0	1	0	0

Hence rather than looking at the specific labellings to be chosen for each of the plys $P_{t_1}^{l_1}(u_1, w)$ and $P_{t_2}^{l_2}(u_2, w)$We will only look at the vertex-label balance combination that arises in the two plys based on this choice. This yields only 10 cases, which we list in Table IV.

We will retain the vertex label balance in $P_{t_1}^{l_1}(u_1, w)$ as it is, and tweak the labelling in $P_{t_2}^{l_2}(u_2, w)$ to achieve the vertex label balance in the double uniform ply. We remark that if any two of the labels $-1, i, -i$ are interchanged, the edge labels are unaffected; however, the vertex label balance will shift between them. For instance, if we replace -1 by i in the labelling α_{10}, we get $v_{\alpha_{10}}(1) = v_{\alpha_{10}}(i) = v_{\alpha_{10}}(-1) + 1 = v_{\alpha_{10}}(-i) + 1$. Thus 1,1,0,0 can be easily mutated to 0,1,1,0.

Case 2: Both Plys Have an Odd Number of Edges

Since there are only 3 cases, we exhibit the choices of function for each ply in Table V. We will choose an existing labelling for each of the uniform plys $P_{t_1}(u_1, w)$ and $P_{t_2}(u_2, w)$ from the library of labellings in Tables I and II.

Table IV: Balance of Labellings for Uniform *t*-ply (Case 1)

Case	Vertex balance	label for F			Vertex label balance for G				Vertex balance	Label for H		
	-1	1	i	$-i$	-1	1	i	$-i$	-1	1	i	$-i$
AA	1	1	0	0	1 Replace -1 of the source by i 0	1 1	0 1	0 0	1	1	1	0
AB	1	1	0	0	1 Replace -1 of source by $-i$ 0	1 1	1 1	0 1	0	0	0	0
AC	1	1	0	0	0	0	0	0	1	0	0	0
AD	1	1	0	0	0	1	0	0	1	1	0	0
BB	1	1	1	0	1 Replace -1 of source by $-i$ 0	1 1	1 1	0 1	0	0	1	0
BC	1	1	1	0	0	0	0	0	1	0	1	0
BD	1	1	1	0	0	1	0	0	1	1	1	0
CC	0	0	0	0	0	0	0	0	1	0	1	1
CD	0	0	0	0	0	1	0	0	0	0	0	0
DD	0	1	0	0	0	1	0	0	0	1	0	0

Table V: Balance of Labellings for Uniform *t*-ply (Case 2)

Case	Vertex balance	label for F			Vertex balance	label for G			Vertex and Edge label balance for H			
	-1	1	i	$-i$	-1	1	i	$-i$	-1	1	i	$-i$
AA′	1	1	0	0	0	1	1	0	1 $e_H(0) = e_H(1)$	1	1	0
AC	1	1	0	0	0	0	0	0	1 $e_H(0) = e_H(1)$	0	0	0
CC′	0	0	0	0	0	0	0	0	1 $e_H(0) = e_H(1)$	0	1	1

Thus, in all cases, we have obtained a group A-cordial labelling of double uniform $\left(t_1^{l_1}, t_2^{l_2}\right)$ −ply with each path of length at least 5.

III. CONCLUSION

In this paper, we have decreased the number of cases greatly and avoided the brute force technique to prove that every double uniform $\left(t_1^{l_1}, t_2^{l_2}\right)$-ply with each path of length at least 5 is a group A-cordial.

DECLARATION STATEMENT

Some of the references cited are older and are noted explicitly as [5]. However, these works remain significant for the current study, as they are pioneering in their fields.

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REFERENCES

1. Gallian, Joseph. (2022). A Dynamic Survey of Graph Labeling. The Electronic Journal of Combinatorics. 1000. 10.37236/11668. https://www.combinatorics.org/files/Surveys/ds6/ds6v25-2022.pdf
2. Ponraj, R., A. Gayathri, and S. Somasundaram. "Pair difference cordial labeling of graphs." *J. Math. Comput. Sci.* 11.3 (2021): 2551-2567. https://scik.org/index.php/jmcs/article/view/5601
3. Radha, Jegan, Yuvaraj Venkatesan, Kamalakannan Vitaldas, and Vijayakumar Perumal. "Group {1,− 1, i,− i} cordial labeling in some classes of graphs." In *AIP Conference Proceedings*, vol. 2790, no. 1, p. 020066. AIP Publishing LLC, 2023. https://doi.org/10.1063/5.0152417
4. Samina Boxwala, Aditi S. Phadke, Pramod N. Shinde, On Group A-Cordial Labelling of Uniform t-Ply, International Journal of Mathematics Trends and Technology, vol. 68, no. 7, pp. 21-25, 2022. https://ijmttjournal.org/archive/ijmtt-v68i7p504
5. Cahit, Ibrahim. Cordial Graphs: A Weaker Version of Graceful and Harmonious Graphs. Ars Combinatoria, 23. (1987), 201-208. https://www.researchgate.net/publication/233792958-Cordial-Graphs-A-Weaker-Version-of-Graceful-and-Harmonious-Graphs, works remain significant, see the declaration
6. Chandra, B. and Kala, Rukhmoni. Group S_3 Cordial prime labelling of graphs, Malaya Journal of Mathematics. S. (2019), 403-407. https://www.malayajournal.org/articles/MJM0S010072.pdf https://doi.org/10.26637/MJM0S01/0072
7. Chandra, B. and Kala, Rukhmoni. Group S_3 Cordial Prime Labelling of Some Graphs, International Journal of Applied Engineering Research, Volume 14, Number 22 (2019), 4203-4208. https://www.ripublication.com/ijaer19/ijaerv14n22_15.pdf
8. Athisayanathan, S., Ponraj, R., and Karthik Chidambaram, M. K., Group open brace 1, minus 1, M., K., Group $\{1, -1, i, -i\}$ Cordial labelling of sum of P_n and K_n, Journal of Mathematical and Computational Science, Vol 7, No 2 (2017), 335-346. https://www.scik.org/index.php/jmcs/article/view/3075
9. M. K. Karthik Chidambaram, S. Athisayanathan and R. Ponraj, Group $\{1, -1, i, -i\}$ Cordial Labelling of Special Graphs, Palestine Journal of Mathematics Vol. 9(1) (2020), 69-76.

https://pjm.ppu.edu/sites/default/files/papers/PJM_October2019_69to76.pdf

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Teaching Experience:

More than 15 years of teaching experience at undergraduate and postgraduate levels. Nowrosjee Wadia College, Pune (2011 – Present)

Research Work: Completed a BCUD Research Project (₹1.55 Lakhs) funded by Savitribai Phule Pune University titled "On Prime Ideals in Partially Ordered Sets" (2014–2016).

Publications:

Dr. Mundlik has published 10 research papers in reputed international journals such as Soft Computing, Order, Mathematica Slovaca, Asian-European Journal of Mathematics, and Palestine Journal of Mathematics. One paper is currently in press (2025).

Academic Activities:

- Delivered invited lectures at the Department of Mathematics, University of Pune and the Institute of Science, Mumbai.
- Presented research papers at several national and international conferences, including conferences of the Indian Mathematical Society.
- Received Best Paper Presentation Award at the International Conference in Algebra and Discrete Mathematics (Madurai Kamaraj University, 2018).

Professional Memberships:

- Life Member, Indian Mathematical Society (IMS)
- Life Member, Academy of Discrete Mathematics and Applications (ADMA)
- Member, The Mathematics Consortium