IJCRT.ORG ISSN : 2320-2882
INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

Smarandachely product cordial labeling of Triangular graph with Truth Table

Dibya Gulab Minj
Assistant Professor, Department of Mathematics, Holy Cross Women's College Ambikapur-497001, Chhattisgarh, India

Abstract- In this paper the researcher investigates the labeling of N-Triangular Graph (N-T_3) by admitting the condition of Smarandachely product cordial labeling by preparing the truth table.

Smarandachely product cordial labeling on G is such a labeling f:E(G)→{0,1} with induced labeling f(u)f(v) on edge uv∈ $E(G)$ that $v_f(0)$-$v_f(1)$| ≥ 2 and $|e_f(0)$ - $e_f(1)|$≥2.

Key Words- Cordial labeling, Smarandachely product cordial labeling, Triangular Graph

Introduction- Graph labeling is a vast growing research area, which has many applications to the science and technology. Graph labeling is used in radio-astronomy, development of radar and missile guidance codes, spectral characterization of material using x-ray crystallography, communication networks and transportation network. A graph labeling is an assignment of integers to the vertices or edges or both, subject to certain conditions. Labeling helps to distinguish between any two adjacent vertices or edges. Graph labeling was first introduced in the year 1967 by Rosa [1].

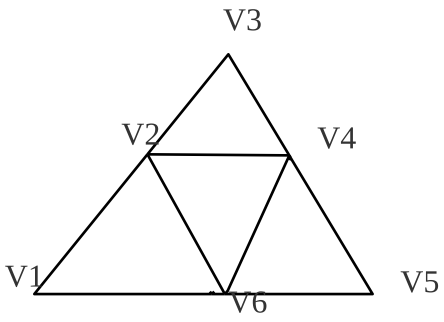
Smarandachely Product Cordial Labeling, introduced by Florentin Smarandache [2] in 1996, explores the cordiality of graphs under a product operation. Smarandachley product cordial labeling was defined in 2018 by S.K.Patel, U.M.Prajapati and A.N. Kansagara [3] on Product cordial labeling of extensions of Barbell Graph. They dealt with study of the product cordial labeling of graphs that obtained by applying various graph operations on barbell graph.

Now the researcher is going to work on a different kind of graph which is known as Triangular graph. Graphs can be used to model interconnection networks in which vertices correspond to processors of the network and the edges correspond to communication links. A new interconnection network topology which is called the triangular graph has been introduced by truth table, which satisfies the condition of SmaranDachely Product Cordial labeling.

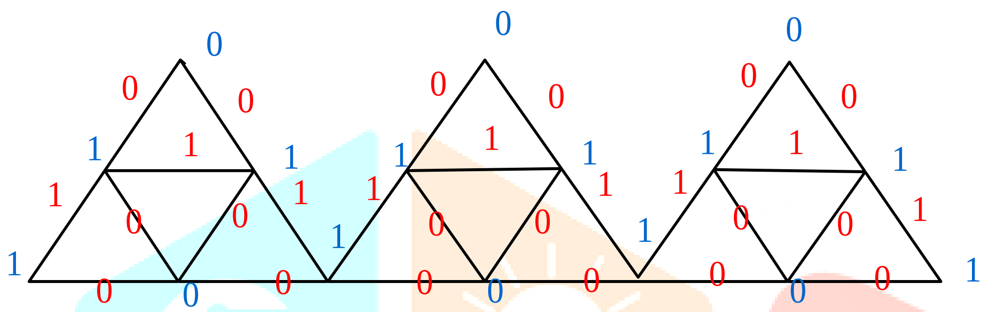
Theorem- The N-Triangular Graph (N-T_3) admits Smarandachely Product Cordial Labeling N ≥ 3.

Proof- Case 1- When N is odd Number- All the vertices (V1, V2, V3, V4, V5, and V6) are labeled with (1, 1, 0, 1, 1, 0) respectively.

Triangular Graph-



$3T_3$



$$v(0)=6, v(1)=10$$

$$\left|\sum v(0)-\sum v(1)\right| \geq 2$$

$$|6-10| \geq 2$$

$$4 \geq 2$$

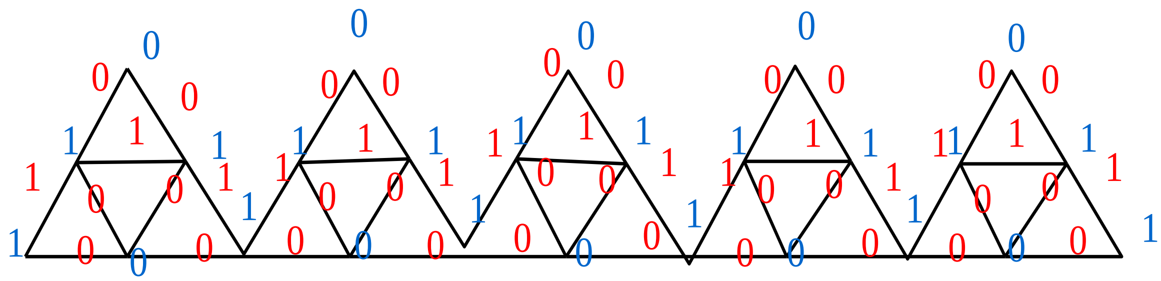
$$e(0)=9, e(1)=18$$

$$\left|\sum e(0)-\sum e(1)\right| \geq 2$$

$$|9-18| \geq 2$$

$$9 \geq 2$$

$5T_3$



$$v(0) = 10\, v(1) = 16$$

$$\left|\sum v(0) - \sum v(1)\right| \geq 2$$

$$|10 - 16| \geq 2$$

$$6 \geq 2$$

$$e(0) = 30, e(1) = 15$$

$$\left|\sum e(0) - \sum e(1)\right| \geq 2$$

$$|30 - 15| \geq 2$$

$$15 \geq 2$$

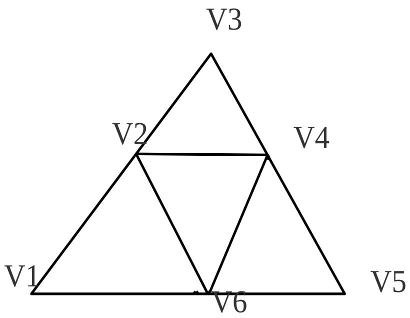
Truth Table -When N is odd-

N-T_3	V(0)	V(1)	$\left\|\sum v(0) - \sum v(1)\right\| \geq 2$	e(0)	e(1)	$\left\|\sum e(0) - \sum e(1)\right\| \geq 2$
3-T_3	6	10	4	18	9	9
5-T_3	10	16	6	30	15	15
7-T_3	14	22	8	42	21	21
9-T_3	18	28	10	54	27	27
11-T_3	22	34	12	66	33	33
13-T_3	26	40	14	78	39	39
15-T_3	30	46	16	90	45	45
17-T_3	34	52	18	102	51	51
19-T_3	40	58	18	114	57	57
21-T_3	44	64	20	126	63	63
23-T_3	48	70	22	138	69	69
25-T_3	52	76	24	150	75	75
27-T_3	56	82	26	162	81	81
29-T_3	60	88	28	174	87	87
31-T_3	64	94	30	186	93	93
33-T_3	68	100	32	198	99	99
35-T_3	72	106	34	210	105	105
37-T_3	76	112	36	222	111	111
39-T_3	80	118	38	234	117	117
41-T_3	84	124	40	246	123	123
43-T_3	88	130	42	258	129	129
45-T_3	92	136	44	270	135	135
47-T_3	96	142	46	282	141	141
49-T_3	100	148	48	294	147	147
51-T_3	104	154	50	306	153	153

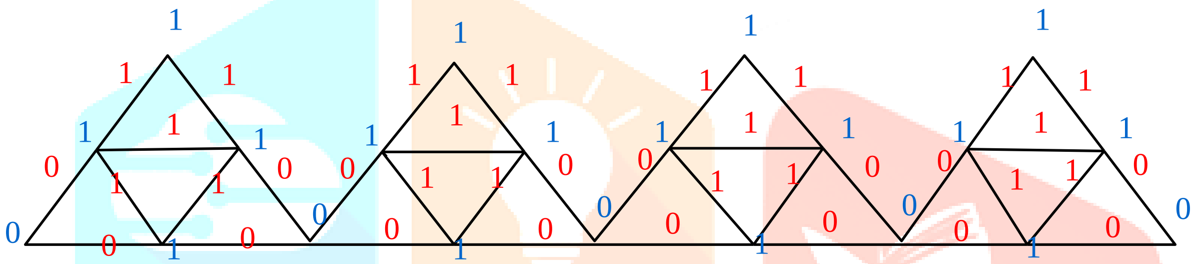
So on……………

Case2- When N is even – Here vertices (V1,V2,V3,V4,V5,V6) are labeled with (0,1,1,1,0,1) respectively.

Triangular Graph-



$4T_3$



$v(0)=8\ v(1)=16$

$\left|\sum v(0)-\sum v(1)\right|\geq 2$

$|8-16|\geq 2$

$8\geq 2$

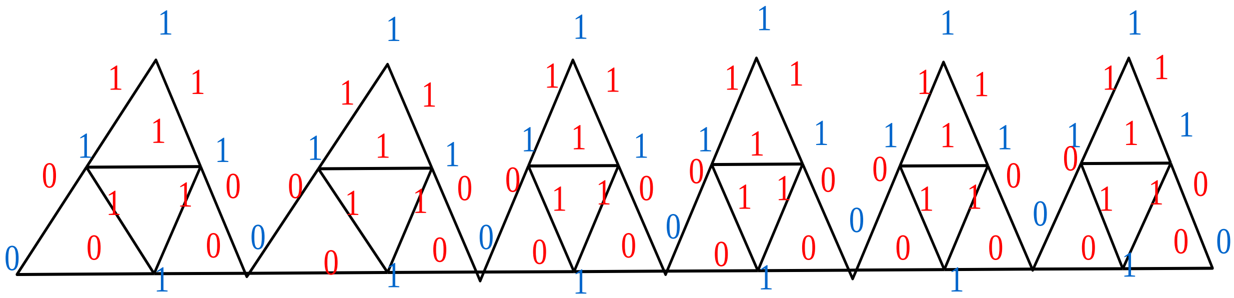
$e(0)=16, e(1)=20$

$\left|\sum e(0)-\sum e(1)\right|\geq 2$

$|16-20|\geq 2$

$4\geq 2$

$6T_3$



$v(0)=12\, v(1)=24$

$\left|\sum v(0)-\sum v(1)\right| \geq 2$

$|12-24| \geq 2$

$12 \geq 2$

$e(0)=24, e(1)=30$

$\left|\sum e(0)-\sum e(1)\right| \geq 2$

$|24-30| \geq 2$

$6 \geq 2$

Truth Table - When N is even-

N-T_n	V(0)	V(1)	$\left\lvert\sum v(0)-\sum v(1)\right\rvert \geq 2$	e(0)	e(1)	$\left\lvert\sum e(0)-\sum e(1)\right\rvert \geq 2$
4-T_3	8	16	8	16	20	4
6-T_3	12	24	12	24	30	6
8-T_3	16	32	16	32	40	8
10-T_3	20	40	20	40	50	10
12-T_3	24	48	24	48	60	12
14-T_3	28	56	28	56	70	14
16-T_3	32	64	32	64	80	16
18-T_3	36	72	36	72	90	18
20-T_3	40	80	40	80	100	20
22-T_3	44	88	44	88	110	22
24-T_3	48	96	48	96	120	24
26-T_3	52	104	52	104	130	26
28-T_3	56	112	56	112	140	28
30-T_3	60	120	60	120	150	30
32-T_3	64	128	64	128	160	32
34-T_3	68	136	68	136	170	34
36-T_3	72	144	72	144	180	36
38-T_3	76	152	76	152	190	38
40-T_3	80	160	80	160	200	40
42-T_3	84	168	84	168	210	42
44-T_3	88	176	88	176	220	44
46-T_3	92	184	92	184	230	46
48-T_3	96	192	96	192	240	48
50-T_3	100	200	100	200	250	50

So on……

Conclusion- Smarandachely product techniques, researchers have delved into the structural properties of graphs, unraveling new patterns and relationships for the Triangular Graph. This research contributes to the broader landscape of graph theory, fostering a deeper comprehension of the intricate interplay within graphs. It leaves open avenues for future research and invites scholars to build upon these foundations.

Here we labeled the Triangular Graph which satisfies the condition of Smarandachely product cordial labeling on G that is f:E(G)→{0,1} with induced labelling f(u)f(v) on edge uv∈ E(G) that $|v_f(0)-v_f(1)| \geq 2$ and $|e_f(0) - e_f(1)| \geq 2$.

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