Fuzzy Quotient-3 Cordial Labeling of Generalized Jahangir Graph and its Subdivision Graph

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Abstract: Let the function$\sigma : V \to [0,1]$ defined by $\sigma(\vartheta) = \frac{\gamma}{10}, \gamma \in Z_4 - \{0\}$is called the fuzzy quotient-3 cordiallabeling if for each edges$\omega\vartheta \in E$, define $\mu : E \to [0,1]$ by $\mu(\omega\vartheta) = \frac{1}{10}\left\lceil\frac{3\sigma(\omega)}{\sigma(\vartheta)}\right\rceil$where $\sigma(\omega) \leq \sigma(\vartheta)$ such that $\nu_\sigma(i)$ and $\nu_\sigma(j)$ differ by atmost 1 and $e_\mu(i)$ and $e_\mu(j)$ differ by atmost 1 where $\nu_\sigma(i)$ and $e_\mu(i)$ represents the number of vertices and edges assigned with $i \in \{\frac{\gamma}{10}, \gamma \in Z_4 - \{0\}\}$. When the graph $G(V,E)$admits fuzzy quotient-3 cordiallabeling, then $G(V,E)$is fuzzy quotient-3 cordial graph. Fuzzy quotient -3 cordial labeling on generalized Jahangir graph and its subdivision are investigated and the works are presented in this paper.
Keywords: Subdivision graph, Generalised Jahangir graph, Subdivision generalised Jahangir graph,Fuzzy quotient-3 cordial graph.

1. Introduction

Assigning of values under certain rules to the graph G is called graph labeling. Rosa (1967) or Graham & Sloane (1980) introduced the graph labeling methods. Among many researchers, graph labeling has been creating a lot of interest and motivation besides their practical applications, there are also various applications in other fields of mathematics. The excellent dynamic survey by Gallian on graph labeling gives an exhaustive survey on the results of graph labeling. Motivated by these labels, we introduced a cordial fuzzy quotient-3 label and proved to be a fuzzy quotient-3 cordial label for some graph families. In this paper the generalized Jahangir graph and its subdivisions are investigated and proved that the graphs are fuzzy quotient - 3 cordial.

2. Definitions

Definition 2.1.Subdivision graph

The subdivision graph is the graph obtained by inserting an additional vertex into each edge of G, denoted as $S(G)$.

Definition 2.2.Generalized Jahangir graph $\mathcal{J}_{s,t}$

The generalized Jahangir graph $\mathcal{J}_{s,t}$ is a graph with $st+1$ vertices consisting of a cycle C_{st} such that one vertex is adjacent to t vertices at a distance s to each other on C_{st}.

Definition 2.3.$S^1(\mathcal{J}_{s,t})$ graph

The graph denoted by $S^1(\mathcal{J}_{s,t})$ is obtained by inserting an additional vertex into each edge of a cycle C_{st} in the graph $\mathcal{J}_{s,t}$.

Definition 2.4.$S^2(\mathcal{J}_{s,t})$ graph

The graph denoted by $S^2(\mathcal{J}_{s,t})$ is obtained from the graph $\mathcal{J}_{s,t}$ by inserting an additional vertex into each edge which are all incident with the centre vertex of $\mathcal{J}_{s,t}$.

Definition 2.5.$S(\mathcal{J}_{s,t})$ graph

The graph denoted by $S(\mathcal{J}_{s,t})$ is obtained by inserting an additional vertex into each edge of the graph $\mathcal{J}_{s,t}$.

Definition 2.6.Fuzzy quotient-3 cordial graph

A graph G with order p and size q. Let the function$\sigma : V \to [0,1]$ defined by $\sigma(\vartheta) = \frac{\gamma}{10}, \gamma \in Z_4 - \{0\}$is called the fuzzy quotient-3 cordiallabeling if for each edges$\omega\vartheta \in E$, define $\mu : E \to [0,1]$ by $\mu(\omega\vartheta) = \frac{1}{10}\left\lceil\frac{3\sigma(\omega)}{\sigma(\vartheta)}\right\rceil$where $\sigma(\omega) \leq \sigma(\vartheta)$ such that $\nu_\sigma(i)$ and $\nu_\sigma(j)$ differ by atmost 1 and $e_\mu(i)$ and $e_\mu(j)$ differ by atmost 1 where $\nu_\sigma(i)$ and $e_\mu(i)$ represents the number of vertices and edges assigned with $i \in \{\frac{\gamma}{10}, \gamma \in Z_4 - \{0\}\}$. When the graph $G(V,E)$admits fuzzy quotient-3 cordiallabeling, then $G(V,E)$ is fuzzy quotient-3 cordial graph.

3. Main Result

Theorem 3.1. The generalized Jahangir graph $\mathcal{J}_{s,t}$ is fuzzy quotient - 3 cordial, for $s \geq 2$ and $t \geq 2$.

Proof: Let G be a generalized Jahangir graph$\mathcal{J}_{s,t}$.$V(G) = \{c\} \cup \{c_i: 1 \leq i \leq st\}$and
$E(G) = \{c_i c_{i+1}: 1 \leq i \leq st - 1\} \cup \{c_1 c_{st}\} \cup \{cc_{s(i-1)+1}: 1 \leq i \leq t\}$.$p = st + 1$ and $q = st + t$.
To define $\sigma: V(G) \to [0,1]$ the following cases are to be considered.

Case 1:$s \equiv 0(mod\ 6)$

$$\sigma(c) = 0.1$$

For $k \equiv 1(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0,1(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 3,4(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \leq i \leq s$
For $k \equiv 2(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 4,5(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 1,2(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 0,3(mod\ 6)$ $1 \leq i \leq s$
For $k \equiv 0(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 2,3(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0,5(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1,4(mod\ 6)$ $1 \leq i \leq s$

Case 2:$s \equiv 1(mod\ 6)$

Subcase 2.1:$t \equiv 0(mod\ 3)$

$$\sigma(c) = 0.1$$

For $k \equiv 1(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0,1(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 3,4(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \leq i \leq s$
For $k \equiv 2(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 2,3(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0,5(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1,4(mod\ 6)$ $1 \leq i \leq s$
For $k \equiv 0(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0,5(mod\ 6)$ $1 \leq i \leq s - 1$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 2,3(mod\ 6)$ $1 \leq i \leq s - 1$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1,4(mod\ 6)$ $1 \leq i \leq s - 1$

$$\sigma(c_{s(k)}) = 0.2$$

Subcase 2.2:$t \equiv 1(mod\ 3)$

$$\sigma(c) = 0.1$$

For $k \equiv 1(mod\ 3) 1 \leq k \leq t - 1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0,1(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 3,4(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \leq i \leq s$
For $k \equiv 2(mod\ 3) 1 \leq k \leq t - 1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 2,3(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0,5(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1,4(mod\ 6)$ $1 \leq i \leq s$
For $k \equiv 0(mod\ 3) 1 \leq k \leq t - 1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0,5(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 2,3(mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1,4(mod\ 6)$ $1 \leq i \leq s$

For $k = t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 3,4(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0,1(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \le i \le s$
Subcase 2.3:$t \equiv 2(mod\ 3)$
If t is even
$\sigma(c) = 0.3$
$\sigma(c_i) = 0.1$ $if i \equiv 0,1(mod\ 6)$ $1 \le i \le st - 1$
$\sigma(c_i) = 0.2$ $if i \equiv 3,4(mod\ 6)$ $1 \le i \le st - 1$
$\sigma(c_i) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \le i \le st - 1$
$\sigma(c_{st}) = 0.2$
If t is odd
$\sigma(c) = 0.3$
$\sigma(c_i) = 0.1$ $if i \equiv 1,2(mod\ 6)$ $1 \le i \le st$
$\sigma(c_i) = 0.2$ $if i \equiv 4,5(mod\ 6)$ $1 \le i \le st$
$\sigma(c_i) = 0.3$ $if i \equiv 0,3(mod\ 6)$ $1 \le i \le st$
Case 3:$s \equiv 2(mod\ 6)$
Subcase 3.1:$t \equiv 0(mod\ 3)$
$\sigma(c) = 0.1$
$\sigma(c_i) = 0.1$ $if i \equiv 1,2(mod\ 6)$ $1 \le i \le st$
$\sigma(c_i) = 0.2$ $if i \equiv 4,5(mod\ 6)$ $1 \le i \le st$
$\sigma(c_i) = 0.3$ $if i \equiv 0,3(mod\ 6)$ $1 \le i \le st$
Subcase 3.2:$t \equiv 1(mod\ 3)$
$\sigma(c) = 0.1$
For $k \equiv 1(mod\ 3) 1 \le k \le t - 1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0,1(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 3,4(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \le i \le s$
For $k \equiv 2(mod\ 3) 1 \le k \le t - 1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 2,3(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0,5(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1,4(mod\ 6)$ $1 \le i \le s$
For $k \equiv 0(mod\ 3) 1 \le k \le t - 1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 4,5(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 1,2(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 0,3(mod\ 6)$ $1 \le i \le s$
For $k = t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 3,4(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0,1(mod\ 6)$ $1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2,5(mod\ 6)$ $1 \le i \le s$
Subcase 3.3:$t \equiv 2(mod\ 3)$
$\sigma(c) = 0.3$
$\sigma(c_i) = 0.1$ $if i \equiv 1,2(mod\ 6)$ $1 \le i \le st$
$\sigma(c_i) = 0.2$ $if i \equiv 4,5(mod\ 6)$ $1 \le i \le st$
$\sigma(c_i) = 0.3$ $if i \equiv 0,3(mod\ 6)$ $1 \le i \le st$
Case 4:$s \equiv 3(mod\ 6)$
Subcase 4.1:$s = 3$ and $t \equiv 0,1(mod\ 3)$
$\sigma(c_{is-2}) = 0.1$ $if i \equiv 0,1(mod\ 3)$ $1 \le i \le t$
$\sigma(c_{is-2}) = 0.3$ $if i \equiv 2(mod\ 3)$ $1 \le i \le t$
$\sigma(c_{is-1}) = 0.1$ $if i \equiv 2(mod\ 3)$ $1 \le i \le t$
$\sigma(c_{is-1}) = 0.2$ $if i \equiv 0,1(mod\ 3)$ $1 \le i \le t$
$\sigma(c_{is}) = 0.2$ $if i \equiv 0(mod\ 3)$ $1 \le i \le t$
$\sigma(c_{is}) = 0.3$ $if i \equiv 1,2(mod\ 3)$ $1 \le i \le t$
Subcase 4.2:$s = 3$ and $t \equiv 2(mod\ 3)$
$\sigma(c) = 0.1$

$\sigma(c_{is-2}) = 0.1 \quad if i \equiv 0,1(mod\ 3) \quad 1 \le i \le t-2$
$\sigma(c_{is-2}) = 0.3 \quad if i \equiv 2(mod\ 3) \quad 1 \le i \le t-2$
$\sigma(c_{is-1}) = 0.1 \quad if i \equiv 2(mod\ 3) \quad 1 \le i \le t-2$
$\sigma(c_{is-1}) = 0.2 \quad if i \equiv 0,1(mod\ 3) \quad 1 \le i \le t-2$
$\sigma(c_{is}) = 0.2 \quad if i \equiv 0(mod\ 3) \quad 1 \le i \le t-2$
$\sigma(c_{is}) = 0.3 \quad if i \equiv 1,2(mod\ 3) \quad 1 \le i \le t-2$
$\sigma(c_{s(t-1)-2}) = 0.2$, $\sigma(c_{s(t-1)-1}) = 0.1$, $\sigma(c_{s(t-1)}) = 0.3$
$\sigma(c_{s(t)-2}) = 0.3$, $\sigma(c_{s(t)-1}) = 0.1$, $\sigma(c_{s(t)}) = 0.2$

Subcase 4.3: $n \ge 9$ and $t \equiv 0,1,2(mod\ 3)$

$$\sigma(c) = 0.2$$

For $1 \le k \le t$
$\sigma(c_{s(k-1)+i}) = 0.1 \quad if i \equiv 4,5(mod\ 6) \quad 1 \le i \le s-3$
$\sigma(c_{s(k-1)+i}) = 0.2 \quad if i \equiv 1,2(mod\ 6) \quad 1 \le i \le s-3$
$\sigma(c_{s(k-1)+i}) = 0.3 \quad if i \equiv 0,3(mod\ 6) \quad 1 \le i \le s-3$
$\sigma(c_{is-2}) = 0.1 \quad 1 \le i \le t$
$\sigma(c_{is-1}) = 0.2 \quad if i \equiv 0,1(mod\ 3) \quad 1 \le i \le t$
$\sigma(c_{is-1}) = 0.3 \quad if i \equiv 2(mod\ 3) \quad 1 \le i \le t$
$\sigma(c_{is}) = 0.2 \quad if i \equiv 2(mod\ 3) \quad 1 \le i \le t$
$\sigma(c_{is}) = 0.3 \quad if i \equiv 0,1(mod\ 3) \quad 1 \le i \le t$

Case 5: $s \equiv 4(mod\ 6)$

Subcase 5.1: $t \equiv 0,1(mod\ 3)$

$$\sigma(c) = 0.3$$

$\sigma(c_i) = 0.1 \quad if i \equiv 1,2(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.2 \quad if i \equiv 4,5(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.3 \quad if i \equiv 0,3(mod\ 6) \quad 1 \le i \le st$

Subcase 5.2: $t \equiv 2(mod\ 3)$

$$\sigma(c) = 0.1$$

$\sigma(c_i) = 0.1 \quad if i \equiv 1,2(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_i) = 0.2 \quad if i \equiv 4,5(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_i) = 0.3 \quad if i \equiv 0,3(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_{(st-1)+i}) = 0.1 \quad if i \equiv 0,5(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{(st-1)+i}) = 0.2 \quad if i \equiv 2,3(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{(st-1)+i}) = 0.3 \quad if i \equiv 1,4(mod\ 6) \quad 1 \le i \le s$

Case 6: $s \equiv 5(mod\ 6)$

Subcase 6.1: $t \equiv 0(mod\ 3)$

$$\sigma(c) = 0.1$$

$\sigma(c_i) = 0.1 \quad if i \equiv 0,1(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.2 \quad if i \equiv 3,4(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.3 \quad if i \equiv 2,5(mod\ 6) \quad 1 \le i \le st$

Subcase 6.2: $t \equiv 1(mod\ 3)$

$$\sigma(c) = 0.1$$

$\sigma(c_i) = 0.1 \quad if i \equiv 0,1(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_i) = 0.2 \quad if i \equiv 3,4(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_i) = 0.3 \quad if i \equiv 2,5(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1 \quad if i \equiv 0,1(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.2 \quad if i \equiv 3,4(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.3 \quad if i \equiv 2,5(mod\ 6) \quad 1 \le i \le s$

Subcase 6.3: $t \equiv 2(mod\ 3)$

$$\sigma(c) = 0.1$$

$\sigma(c_i) = 0.1 \quad if i \equiv 0,1(mod\ 6) \quad 1 \le i \le s(t-2)$
$\sigma(c_i) = 0.2 \quad if i \equiv 3,4(mod\ 6) \quad 1 \le i \le s(t-2)$
$\sigma(c_i) = 0.3 \quad if i \equiv 2,5(mod\ 6) \quad 1 \le i \le s(t-2)$
$\sigma(c_{s(t-2)+i}) = 0.1 \quad if i \equiv 0,1(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(t-2)+i}) = 0.2 \quad if i \equiv 3,4(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(t-2)+i}) = 0.3 \quad if i \equiv 2,5(mod\ 6) \quad 1 \le i \le s$

$\sigma(c_{s(t-1)+i}) = 0.1$ $\quad if i \equiv 2,3(mod\ 6)$ $\quad 1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.2$ $\quad if i \equiv 0,5(mod\ 6)$ $\quad 1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.3$ $\quad if i \equiv 1,4(mod\ 6)$ $\quad 1 \le i \le s$

Table.1. $v_\sigma(i)$ *and* $e_\mu(i)$ *for the graph* $\mathcal{J}_{s,t}$, $i \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}$.

Nature of s and t	$v_\sigma(0.1)$	$v_\sigma(0.2)$	$v_\sigma(0.3)$	$e_\mu(0.1)$	$e_\mu(0.2)$	$e_\mu(0.3)$
$s \equiv 0(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 0(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$
$s \equiv 0(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 1(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 1(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 1(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s = 3$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s = 3$ $t \equiv 1(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$
$s = 3$ $t \equiv 2(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 3(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 3(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$
$s \equiv 3(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$
$s \equiv 4(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 4(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 4(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$

$s \equiv 5(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 5(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 5(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$

From the table 1, we find that $|v_\sigma(i) - v_\sigma(j)| \leq 1$ and $|e_\mu(i) - e_\mu(j)| \leq 1$ for $i, j \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}$ which satisfies the condition of fuzzy quotient - 3 cordial labeling. Hence we concluded that the generalized Jahangir graph $\mathcal{J}_{s,t}$ is fuzzy quotient - 3 cordial.

Theorem 3.2. The graph $S^1(\mathcal{J}_{s,t})$ is fuzzy quotient - 3 cordial, for $s \geq 2$ and $t \geq 2$.

Proof: Let G be a $S^1(\mathcal{J}_{s,t}).V(S^1(\mathcal{J}_{s,t})) = \{c\} \cup \{c_i: 1 \leq i \leq 2st\}$ and $E(\mathcal{J}_{s,t}) = \{c_ic_{i+1}: 1 \leq i \leq 2st-1\} \cup \{c_1c_{2st}\} \cup \{cc_{2s(i-1)+1}: 1 \leq i \leq t\}$. $p = 2st + 1$ and $q = 2st + t$.
To define $\sigma: V(G) \to [0,1]$ the following cases are to be considered.
Case 1:$s \equiv 0,3(mod\ 6)$

$$\sigma(c) = 0.1$$

For $k \equiv 1(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
For $k \equiv 2(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq s$
For $k \equiv 0(mod\ 3) 1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$
Case 2:$s \equiv 1,4(mod\ 6)$
Subcase 2.1:$t \equiv 0(mod\ 3)$

$$\sigma(c) = 0.1$$

$\sigma(c_i) = 0.1$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq st$
$\sigma(e_i) = 0.1$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq st$
$\sigma(e_i) = 0.2$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq st$
$\sigma(e_i) = 0.3$ $\quad if i \equiv 0(mod\ 3)\ \ 1 \leq i \leq st$
Subcase 2.2:$t \equiv 1(mod\ 3)$

$$\sigma(c) = 0.1$$

For $k \equiv 1(mod\ 3) 1 \leq k \leq t-1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \leq i \leq s$

$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
For $k \equiv 2(mod\ 3) 1 \le k \le t-1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
For $k \equiv 0(mod\ 3) 1 \le k \le t-1$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
For $k = t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
Subcase 2.3:$t \equiv 2(mod\ 3)$

$$\sigma(c) = 0.3$$

$\sigma(c_i) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le st$
$\sigma(c_i) = 0.2$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le st$
$\sigma(c_i) = 0.3$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le st$
$\sigma(e_i) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le st$
$\sigma(e_i) = 0.2$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le st$
$\sigma(e_i) = 0.3$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le st$
Case 3:$s \equiv 2,5(mod\ 6)$
Subcase 3.1:$t \equiv 0,1(mod\ 3)$

$$\sigma(c) = 0.3$$

$\sigma(c_i) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le st$
$\sigma(c_i) = 0.2$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le st$
$\sigma(c_i) = 0.3$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le st$
$\sigma(e_i) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le st$
$\sigma(e_i) = 0.2$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le st$
$\sigma(e_i) = 0.3$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le st$
Subcase 3.2$t \equiv 2(mod\ 3)$

$$\sigma(c) = 0.1$$

$\sigma(c_i) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le st-1$
$\sigma(c_i) = 0.2$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le st-1$
$\sigma(c_i) = 0.3$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le st-1$
$\sigma(e_i) = 0.1$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le st-1$
$\sigma(e_i) = 0.2$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le st-1$
$\sigma(e_i) = 0.3$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le st-1$
$\sigma(c_{(st-1)+i}) = 0.1$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{(st-1)+i}) = 0.2$ $if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$
$\sigma(c_{(st-1)+i}) = 0.3$ $if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{(st-1)+i}) = 0.1$ $if i \equiv 0(mod\ 3)\ \ 1 \le i \le s$

$\sigma(e_{(st-1)+i}) = 0.2$ $\quad if i \equiv 1(mod\ 3)\ \ 1 \le i \le s$
$\sigma(e_{(st-1)+i}) = 0.3$ $\quad if i \equiv 2(mod\ 3)\ \ 1 \le i \le s$

Table.2. $\boldsymbol{v_\sigma(i)}$ ***and*** $\boldsymbol{e_\mu(i)}$ ***for the graph*** $\boldsymbol{S^1(\mathcal{J}_{s,t})}$, $\boldsymbol{i \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}}$.

Nature of s and t	$v_\sigma(0.1)$	$v_\sigma(0.2)$	$v_\sigma(0.3)$	$e_\mu(0.1)$	$e_\mu(0.2)$	$e_\mu(0.3)$
$s \equiv 0,3(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 0,3(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$
$s \equiv 0,3(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 1,4(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 1,4(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 1,4(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2,5(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2,5(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 2,5(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$

From the table 2, we find that $|v_\sigma(i) - v_\sigma(j)| \le 1$ and $|e_\mu(i) - e_\mu(j)| \le 1$ for $i, j \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}$ which satisfies the condition of fuzzy quotient - 3 cordial labeling. Hence we concluded that the graph $S^1(\mathcal{J}_{s,t})$ is fuzzy quotient - 3 cordial.

Theorem 3.3. The graph $S^2(\mathcal{J}_{s,t})$ is fuzzy quotient-3 cordial graph, for $s \ge 2$ and $t \ge 2$.

Proof: Let G be the $S^2(\mathcal{J}_{s,t})$ graph. $V(S(\mathcal{J}_{s,t})) = \{c_i: 1 \le i \le st\} \cup \{c\} \cup \{d_i: 1 \le i \le t\}$ and $E(S(\mathcal{J}_{s,t})) = \{c_ic_{i+1}: 1 \le i \le st-1\} \cup \{c_1c_{st}\} \cup \{cd_j: 1 \le j \le t\} \cup \{d_jc_{s(j-1)+1}: 1 \le j \le t\}$. $p = st + t + 1$ and $q = st + 2t$. To define $\sigma: V\left(S(\mathcal{J}_{s,t})\right) \to [0,1]$ the following cases are to be considered.

Case 1:$s \equiv 0(mod\ 6)$

$\sigma(c) = 0.2$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 1(mod\ 3)$ $\quad 1 \le j \le t$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 0(mod\ 3)$ $\quad 1 \le j \le t$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 2(mod\ 3)$ $\quad 1 \le j \le t$

If $k \equiv 1,2(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$ $\quad if\ i \equiv 0,1(mod\ 6)$ $\quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \le i \le s$

If $k \equiv 0(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$ $\quad if\ i \equiv 4,5(mod\ 6)$ $\quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $\quad if\ i \equiv 1,2(mod\ 6)$ $\quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $\quad if\ i \equiv 0,3(mod\ 6)$ $\quad 1 \le i \le s$

Case 2:$s \equiv 1(mod\ 6)$

Subcase 2.1:$t \equiv 0(mod\ 6)$

$\sigma(c) = 0.3$

$\sigma(d_j) = 0.1$	$if\ i \equiv 0,4(mod\ 6)$	$1 \le j \le t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 2,5(mod\ 6)$	$1 \le j \le t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le j \le t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 2,3(mod\ 6)$	$1 \le i \le st$
$\sigma(c_i) = 0.2$	$if\ i \equiv 0,5(mod\ 6)$	$1 \le i \le st$
$\sigma(c_i) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le i \le st$

Subcase 2.2: $t \equiv 1(mod\ 6)$

$\sigma(c) = 0.3$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 0,4(mod\ 6)$	$1 \le j \le t-1$
$\sigma(d_j) = 0.2$	$if\ i \equiv 2,5(mod\ 6)$	$1 \le j \le t-1$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le j \le t-1$
$\sigma(d_t) = 0.1$		
$\sigma(c_i) = 0.1$	$if\ i \equiv 2,3(mod\ 6)$	$1 \le i \le s(t-1)$
$\sigma(c_i) = 0.2$	$if\ i \equiv 0,5(mod\ 6)$	$1 \le i \le s(t-1)$
$\sigma(c_i) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le i \le s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1$	$if\ i \equiv 4,5(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.2$	$if\ i \equiv 1,2(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.3$	$if\ i \equiv 0,3(mod\ 6)$	$1 \le i \le s$

Subcase 2.3: $t \equiv 2(mod\ 6)$

If $t = 2$

$$\sigma(c) = 0.2$$

$\sigma(d_1) = 0.1$, $\sigma(d_2) = 0.3$

$\sigma(c_i) = 0.1$	$if\ i \equiv 0,1(mod\ 6)$	$1 \le i \le st$
$\sigma(c_i) = 0.2$	$if\ i \equiv 3,4(mod\ 6)$	$1 \le i \le st$
$\sigma(c_i) = 0.3$	$if\ i \equiv 2,5(mod\ 6)$	$1 \le i \le st$

If $t \ge 8$

$\sigma(c) = 0.3$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 0,4(mod\ 6)$	$1 \le j \le t-2$
$\sigma(d_j) = 0.2$	$if\ i \equiv 2,5(mod\ 6)$	$1 \le j \le t-2$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le j \le t-2$

$\sigma(d_{t-1}) = 0.1$, $\sigma(d_t) = 0.2$

$\sigma(c_i) = 0.1$	$if\ i \equiv 2,3(mod\ 6)$	$1 \le i \le s(t-2)$
$\sigma(c_i) = 0.2$	$if\ i \equiv 0,5(mod\ 6)$	$1 \le i \le s(t-2)$
$\sigma(c_i) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le i \le s(t-2)$
$\sigma(c_{s(t-2)+i}) = 0.1$	$if\ i \equiv 0,1(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-2)+i}) = 0.2$	$if\ i \equiv 3,4(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-2)+i}) = 0.3$	$if\ i \equiv 2,5(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.1$	$if\ i \equiv 2,3(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.2$	$if\ i \equiv 0,5(mod\ 6)$	$1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \le i \le s$

Subcase 2.4: $t \equiv 3(mod\ 6)$

$\sigma(c) = 0.3$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 1,5(mod\ 6)$	$1 \le j \le t-3$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0,3(mod\ 6)$	$1 \le j \le t-3$
$\sigma(d_j) = 0.3$	$if\ i \equiv 2,4(mod\ 6)$	$1 \le j \le t-3$

$\sigma(d_{t-2}) = 0.2$, $\sigma(d_{t-1}) = 0.1$, $\sigma(d_t) = 0.1$

$\sigma(c_i) = 0.1$	$if\ i \equiv 3,4(mod\ 6)$	$1 \le i \le st-1$
$\sigma(c_i) = 0.2$	$if\ i \equiv 0,1(mod\ 6)$	$1 \le i \le st-1$
$\sigma(c_i) = 0.3$	$if\ i \equiv 2,5(mod\ 6)$	$1 \le i \le st-1$
$\sigma(c_{st}) = 0.3$		

Subcase 2.5: $t \equiv 4(mod\ 6)$

$\sigma(c) = 0.1$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 1,5(mod\ 6)$	$1 \le j \le t-4$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0,3(mod\ 6)$	$1 \le j \le t-4$
$\sigma(d_j) = 0.3$	$if\ i \equiv 2,4(mod\ 6)$	$1 \le j \le t-4$

$\sigma(d_{t-3}) = 0.2$, $\sigma(d_{t-2}) = 0.3$, $\sigma(d_{t-1}) = 0.3$, $\sigma(d_t) = 0.1$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 3,4(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_i) = 0.2 \quad if\ i \equiv 0,1(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_i) = 0.3 \quad if\ i \equiv 2,5(mod\ 6) \quad 1 \le i \le s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1 \quad if\ i \equiv 4,5(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.2 \quad if\ i \equiv 1,2(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(t-1)+i}) = 0.3 \quad if\ i \equiv 0,3(mod\ 6) \quad 1 \le i \le s$

Subcase 2.6:$t \equiv 5(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1 \quad if\ i \equiv 1,5(mod\ 6) \quad 1 \le j \le t-5$
$\sigma(d_j) = 0.2 \quad if\ i \equiv 0,3(mod\ 6) \quad 1 \le j \le t-5$
$\sigma(d_j) = 0.3 \quad if\ i \equiv 2,4(mod\ 6) \quad 1 \le j \le t-5$

$\sigma(d_{t-4}) = 0.1$, $\sigma(d_{t-3}) = 0.1$, $\sigma(d_{t-2}) = 0.2$, $\sigma(d_{t-1}) = 0.3$, $\sigma(d_t) = 0.2$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 2,3(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.2 \quad if\ i \equiv 0,5(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.3 \quad if\ i \equiv 1,4(mod\ 6) \quad 1 \le i \le st$

Case 3:$s \equiv 2(mod\ 6)$

Subcase 3.1:$t \equiv 0(mod\ 6)$

$\sigma(c) = 0.2$
$\sigma(d_j) = 0.1 \quad if\ i \equiv 1(mod\ 3) \quad 1 \le j \le t$
$\sigma(d_j) = 0.2 \quad if\ i \equiv 0(mod\ 3) \quad 1 \le j \le t$
$\sigma(d_j) = 0.3 \quad if\ i \equiv 2(mod\ 3) \quad 1 \le j \le t$

If $k \equiv 1,2(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1 \quad if\ i \equiv 0,1(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2 \quad if\ i \equiv 3,4(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3 \quad if\ i \equiv 2,5(mod\ 6) \quad 1 \le i \le s$

If $k \equiv 0(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1 \quad if\ i \equiv 4,5(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2 \quad if\ i \equiv 1,2(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3 \quad if\ i \equiv 0,3(mod\ 6) \quad 1 \le i \le s$

Subcase 3.2:$t \equiv 1(mod\ 6)$

$\sigma(c) = 0.2$
$\sigma(d_j) = 0.1 \quad if\ i \equiv 1(mod\ 3) \quad 1 \le j \le t$
$\sigma(d_j) = 0.2 \quad if\ i \equiv 0(mod\ 3) \quad 1 \le j \le t$
$\sigma(d_j) = 0.3 \quad if\ i \equiv 2(mod\ 3) \quad 1 \le j \le t$

If $k \equiv 1,2(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1 \quad if\ i \equiv 0,1(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2 \quad if\ i \equiv 3,4(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3 \quad if\ i \equiv 2,5(mod\ 6) \quad 1 \le i \le s$

If $k \equiv 0(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1 \quad if\ i \equiv 4,5(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2 \quad if\ i \equiv 1,2(mod\ 6) \quad 1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3 \quad if\ i \equiv 0,3(mod\ 6) \quad 1 \le i \le s$

Subcase 3.3:$t \equiv 2(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1 \quad if\ i \equiv 0,1(mod\ 6) \quad 1 \le j \le t$
$\sigma(d_j) = 0.2 \quad if\ i \equiv 2,3(mod\ 6) \quad 1 \le j \le t$
$\sigma(d_j) = 0.3 \quad if\ i \equiv 4,5(mod\ 6) \quad 1 \le j \le t$
$\sigma(c_i) = 0.1 \quad if\ i \equiv 0,1(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.2 \quad if\ i \equiv 3,4(mod\ 6) \quad 1 \le i \le st$
$\sigma(c_i) = 0.3 \quad if\ i \equiv 2,5(mod\ 6) \quad 1 \le i \le st$

Subcase 3.4:$t \equiv 3(mod\ 6)$

$\sigma(c) = 0.2$
$\sigma(d_j) = 0.1 \quad if\ i \equiv 2(mod\ 3) \quad 1 \le j \le t$

$\sigma(d_j) = 0.2$	$if\ i \equiv 0(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \leq j \leq t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 1,2(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.2$	$if\ i \equiv 4,5(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.3$	$if\ i \equiv 0,3(mod\ 6)$	$1 \leq i \leq st$

Subcase 3.5:$t \equiv 4(mod\ 6)$

$\sigma(c) = 0.2$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 2(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \leq j \leq t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 1,2(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.2$	$if\ i \equiv 4,5(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.3$	$if\ i \equiv 0,3(mod\ 6)$	$1 \leq i \leq st$

Subcase 3.6:$t \equiv 5(mod\ 6)$

$\sigma(c) = 0.1$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 2,4(mod\ 6)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0,1(mod\ 6)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 3,5(mod\ 6)$	$1 \leq j \leq t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 4,5(mod\ 6)$	$1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.2$	$if\ i \equiv 1,2(mod\ 6)$	$1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.3$	$if\ i \equiv 0,3(mod\ 6)$	$1 \leq i \leq s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1$	$if\ i \equiv 3,4(mod\ 6)$	$1 \leq i \leq s$
$\sigma(c_{s(t-1)+i}) = 0.2$	$if\ i \equiv 0,1(mod\ 6)$	$1 \leq i \leq s$
$\sigma(c_{s(t-1)+i}) = 0.3$	$if\ i \equiv 2,5(mod\ 6)$	$1 \leq i \leq s$

Case 4:$s \equiv 3(mod\ 6)$

Subcase 4.1:$n = 3$ and $t \equiv 0(mod\ 6)$

$\sigma(c) = 0.1$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \leq j \leq t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 2,3(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.2$	$if\ i \equiv 0,5(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \leq i \leq st$

Subcase 4.2:$n = 3$ and $t \equiv 1(mod\ 6)$

$\sigma(c) = 0.1$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 2(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \leq j \leq t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 2,3(mod\ 6)$	$1 \leq i \leq st-1$
$\sigma(c_i) = 0.2$	$if\ i \equiv 0,5(mod\ 6)$	$1 \leq i \leq st-1$
$\sigma(c_i) = 0.3$	$if\ i \equiv 1,4(mod\ 6)$	$1 \leq i \leq st-1$
$\sigma(c_{st}) = 0.2$		

Subcase 4.3:$n = 3$ and $t \equiv 2(mod\ 6)$

$\sigma(c) = 0.1$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \leq j \leq t$
$\sigma(c_i) = 0.1$	$if\ i \equiv 2,5(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.2$	$if\ i \equiv 3,4(mod\ 6)$	$1 \leq i \leq st$
$\sigma(c_i) = 0.3$	$if\ i \equiv 0,1(mod\ 6)$	$1 \leq i \leq st$

Subcase 4.4:$n = 3$ and $t \equiv 3(mod\ 6)$

$\sigma(c) = 0.1$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \leq j \leq t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \leq j \leq t$

$\sigma(c_i) = 0.1$ if $i \equiv 2,5 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.2$ if $i \equiv 3,4 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.3$ if $i \equiv 0,1 (mod\ 6)$ $1 \leq i \leq st$

Subcase 4.5: $n = 3$ and $t \equiv 4 (mod\ 6)$
$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ if $i \equiv 2 (mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ if $i \equiv 0 (mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ if $i \equiv 1 (mod\ 3)$ $1 \leq j \leq t$
$\sigma(c_i) = 0.1$ if $i \equiv 0,5 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.2$ if $i \equiv 2,3 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.3$ if $i \equiv 1,4 (mod\ 6)$ $1 \leq i \leq st$

Subcase 4.6: $n = 3$ and $t \equiv 5 (mod\ 6)$
$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ if $i \equiv 1 (mod\ 3)$ $1 \leq j \leq t-1$
$\sigma(d_j) = 0.2$ if $i \equiv 2 (mod\ 3)$ $1 \leq j \leq t-1$
$\sigma(d_j) = 0.3$ if $i \equiv 0 (mod\ 3)$ $1 \leq j \leq t-1$
$\sigma(d_{t-1}) = 0.2$, $\sigma(d_t) = 0.3$
$\sigma(c_i) = 0.1$ if $i \equiv 0,1 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.2$ if $i \equiv 3,4 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.3$ if $i \equiv 2,5 (mod\ 6)$ $1 \leq i \leq st$

Subcase 4.7: $n \geq 9$ and $t \equiv 0,1,2,3,4,5 (mod\ 6)$
$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ if $i \equiv 0 (mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ if $i \equiv 2 (mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ if $i \equiv 1 (mod\ 3)$ $1 \leq j \leq t$
For $1 \leq k \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ if $i \equiv 4,5 (mod\ 6)$ $1 \leq i \leq s-3$
$\sigma(c_{s(k-1)+i}) = 0.2$ if $i \equiv 1,2 (mod\ 6)$ $1 \leq i \leq s-3$
$\sigma(c_{s(k-1)+i}) = 0.3$ if $i \equiv 0,3 (mod\ 6)$ $1 \leq i \leq s-3$
$\sigma(c_{is-2}) = 0.1$ if $i \equiv 0,2 (mod\ 3)$ $1 \leq i \leq t$
$\sigma(c_{is-2}) = 0.3$ if $i \equiv 1 (mod\ 3)$ $1 \leq i \leq t$
$\sigma(c_{is-1}) = 0.1$ if $i \equiv 1 (mod\ 3)$ $1 \leq i \leq t$
$\sigma(c_{is-1}) = 0.2$ if $i \equiv 2 (mod\ 3)$ $1 \leq i \leq t$
$\sigma(c_{is-1}) = 0.3$ if $i \equiv 0 (mod\ 3)$ $1 \leq i \leq t$
$\sigma(c_{is}) = 0.2$ if $i \equiv 0,1 (mod\ 3)$ $1 \leq i \leq t$
$\sigma(c_{is}) = 0.3$ if $i \equiv 2 (mod\ 3)$ $1 \leq i \leq t$

Case 5: $s \equiv 4 (mod\ 6)$

Subcase 5.1: $t \equiv 0 (mod\ 6)$
$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ if $i \equiv 1,2 (mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ if $i \equiv 0,5 (mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ if $i \equiv 3,4 (mod\ 6)$ $1 \leq j \leq t$
$\sigma(c_i) = 0.1$ if $i \equiv 2,3 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.2$ if $i \equiv 0,5 (mod\ 6)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.3$ if $i \equiv 1,4 (mod\ 6)$ $1 \leq i \leq st$

Subcase 5.2: $t \equiv 1 (mod\ 6)$
$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1$ if $i \equiv 1,2 (mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ if $i \equiv 0,5 (mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ if $i \equiv 3,4 (mod\ 6)$ $1 \leq j \leq t$
$\sigma(c_i) = 0.1$ if $i \equiv 2,3 (mod\ 6)$ $1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.2$ if $i \equiv 0,5 (mod\ 6)$ $1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.3$ if $i \equiv 1,4 (mod\ 6)$ $1 \leq i \leq s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1$ if $i \equiv 0,1 (mod\ 6)$ $1 \leq i \leq s$
$\sigma(c_{s(t-1)+i}) = 0.2$ if $i \equiv 3,4 (mod\ 6)$ $1 \leq i \leq s$

$\sigma(c_{s(t-1)+i}) = 0.3 \quad if\ i \equiv 2{,}5(mod\ 6) \quad 1 \le i \le s$

Subcase 5.3: $t \equiv 2(mod\ 6)$

$\sigma(c) = 0.1$

$\sigma(d_j) = 0.1 \quad if\ i \equiv 1{,}2(mod\ 6) \quad 1 \le j \le t-2$

$\sigma(d_j) = 0.2 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le j \le t-2$

$\sigma(d_j) = 0.3 \quad if\ i \equiv 3{,}4(mod\ 6) \quad 1 \le j \le t-2$

$\sigma(d_{t-1}) = 0.2$, $\sigma(d_t) = 0.3$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 2{,}3(mod\ 6) \quad 1 \le i \le s(t-1)$

$\sigma(c_i) = 0.2 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le i \le s(t-1)$

$\sigma(c_i) = 0.3 \quad if\ i \equiv 1{,}4(mod\ 6) \quad 1 \le i \le s(t-1)$

$\sigma(c_{s(t-1)+i}) = 0.1 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le i \le s-1$

$\sigma(c_{s(t-1)+i}) = 0.2 \quad if\ i \equiv 2{,}3(mod\ 6) \quad 1 \le i \le s-1$

$\sigma(c_{s(t-1)+i}) = 0.3 \quad if\ i \equiv 1{,}4(mod\ 6) \quad 1 \le i \le s-1$

$\sigma(c_{st}) = 0.1$

Subcase 5.4: $t \equiv 3(mod\ 6)$

$\sigma(c) = 0.2$

$\sigma(d_j) = 0.1 \quad if\ i \equiv 2(mod\ 3) \quad 1 \le j \le t$

$\sigma(d_j) = 0.2 \quad if\ i \equiv 0(mod\ 3) \quad 1 \le j \le t$

$\sigma(d_j) = 0.3 \quad if\ i \equiv 1(mod\ 3) \quad 1 \le j \le t$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 0{,}1(mod\ 6) \quad 1 \le i \le st$

$\sigma(c_i) = 0.2 \quad if\ i \equiv 3{,}4(mod\ 6) \quad 1 \le i \le st$

$\sigma(c_i) = 0.3 \quad if\ i \equiv 2{,}5(mod\ 6) \quad 1 \le i \le st$

Subcase 5.5: $t \equiv 4(mod\ 6)$

$\sigma(c) = 0.1$

$\sigma(d_j) = 0.1 \quad if\ i \equiv 1{,}2(mod\ 6) \quad 1 \le j \le t-4$

$\sigma(d_j) = 0.2 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le j \le t-4$

$\sigma(d_j) = 0.3 \quad if\ i \equiv 3{,}4(mod\ 6) \quad 1 \le j \le t-4$

$\sigma(d_{t-3}) = 0.2$, $\sigma(d_{t-2}) = 0.3$, $\sigma(d_{t-1}) = 0.3$, $\sigma(d_t) = 0.2$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 2{,}3(mod\ 6) \quad 1 \le i \le s(t-1)$

$\sigma(c_i) = 0.2 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le i \le s(t-1)$

$\sigma(c_i) = 0.3 \quad if\ i \equiv 1{,}4(mod\ 6) \quad 1 \le i \le s(t-1)$

$\sigma(c_{s(t-1)+1}) = 0.2$

$\sigma(c_{s(t-1)+i}) = 0.1 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 2 \le i \le s$

$\sigma(c_{s(t-1)+i}) = 0.2 \quad if\ i \equiv 2{,}3(mod\ 6) \quad 2 \le i \le s$

$\sigma(c_{s(t-1)+i}) = 0.3 \quad if\ i \equiv 1{,}4(mod\ 6) \quad 2 \le i \le s$

Subcase 5.6: $t \equiv 5(mod\ 6)$

$\sigma(c) = 0.3$

$\sigma(d_j) = 0.1 \quad if\ i \equiv 1{,}2(mod\ 6) \quad 1 \le j \le t-5$

$\sigma(d_j) = 0.2 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le j \le t-5$

$\sigma(d_j) = 0.3 \quad if\ i \equiv 3{,}4(mod\ 6) \quad 1 \le j \le t-5$

$\sigma(d_{t-4}) = 0.1$, $\sigma(d_{t-3}) = 0.2$, $\sigma(d_{t-2}) = 0.1$, $\sigma(d_{t-1}) = 0.2$, $\sigma(d_t) = 0.1$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 2{,}3(mod\ 6) \quad 1 \le i \le st-1$

$\sigma(c_i) = 0.2 \quad if\ i \equiv 0{,}5(mod\ 6) \quad 1 \le i \le st-1$

$\sigma(c_i) = 0.3 \quad if\ i \equiv 1{,}4(mod\ 6) \quad 1 \le i \le st-1$

$\sigma(c_{st}) = 0.3$

Case 6: $s \equiv 5(mod\ 6)$

Subcase 6.1: $t \equiv 0(mod\ 6)$

$\sigma(c) = 0.3$

$\sigma(d_j) = 0.1 \quad if\ i \equiv 0{,}4(mod\ 6) \quad 1 \le j \le t$

$\sigma(d_j) = 0.2 \quad if\ i \equiv 2{,}5(mod\ 6) \quad 1 \le j \le t$

$\sigma(d_j) = 0.3 \quad if\ i \equiv 1{,}3(mod\ 6) \quad 1 \le j \le t$

$\sigma(c_i) = 0.1 \quad if\ i \equiv 0{,}1(mod\ 6) \quad 1 \le i \le st$

$\sigma(c_i) = 0.2 \quad if\ i \equiv 3{,}4(mod\ 6) \quad 1 \le i \le st$

$\sigma(c_i) = 0.3 \quad if\ i \equiv 2{,}5(mod\ 6) \quad 1 \le i \le st$

Subcase 6.2: $t \equiv 1(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 0,4(mod\ 6)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 1,3(mod\ 6)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_t) = 0.1$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 0,1(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \leq i \leq st$

Subcase 6.3: $t \equiv 2(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 0,4(mod\ 6)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 1,3(mod\ 6)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_t) = 0.1$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 0,1(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \leq i \leq st$

Subcase 6.4: $t \equiv 3(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 0,2(mod\ 3)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 1(mod\ 3)$ $\quad 1 \leq j \leq t-1$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 1,2(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 4,5(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 0,3(mod\ 6)$ $\quad 1 \leq i \leq st$

Subcase 6.5: $t \equiv 4(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 0,2(mod\ 3)$ $\quad 1 \leq j \leq t-1$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 1(mod\ 3)$ $\quad 1 \leq j \leq t-1$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 1,2(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 4,5(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 0,3(mod\ 6)$ $\quad 1 \leq i \leq st$

Subcase 6.6: $t \equiv 5(mod\ 6)$

$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 0,4(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 1,3(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 0,1(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 2,5(mod\ 6)$ $\quad 1 \leq i \leq st$

Table.3. $v_\sigma(i)$ ***and*** $e_\mu(i)$***) for the graph*** $S^2(\mathcal{J}_{s,t})$, $i \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}$.

Nature of s and t	$v_\sigma(0.1)$	$v_\sigma(0.2)$	$v_\sigma(0.3)$	$e_\mu(0.1)$	$e_\mu(0.2)$	$e_\mu(0.3)$
$s \equiv 0(mod\ 6)$ $t \equiv 0,3(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 0(mod\ 6)$ $t \equiv 1,4(mod\ 6)$	$\frac{p+1}{3}$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$	$\frac{q+1}{3}$
$s \equiv 0(mod\ 6)$ $t \equiv 2,5(mod\ 6)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$
$s \equiv 1(mod\ 6)$ $t \equiv 0,3(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$

$s \equiv 1(mod\ 6)$ $t \equiv 1,4(mod\ 6)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 1(mod\ 6)$ $t \equiv 2,5(mod\ 6)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 0(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 1(mod\ 6)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$	$\frac{q-1}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 2(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$	$\frac{q+1}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 3(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2(mod\ 6)$ $t \equiv 4(mod\ 6)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$
$s \equiv 2(mod\ 6)$ $t \equiv 5(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$	$\frac{q+1}{3}$
$s \equiv 3(mod\ 6)$ $t \equiv 0,3(mod\ 6)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 3(mod\ 6)$ $t \equiv 1,4(mod\ 6)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$
$s \equiv 3(mod\ 6)$ $t \equiv 2,5(mod\ 6)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$
$s \equiv 4(mod\ 6)$ $t \equiv 0(mod\ 6)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 4(mod\ 6)$ $t \equiv 1,4(mod\ 6)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 4(mod\ 6)$ $t \equiv 2,5(mod\ 6)$	$\frac{p+1}{3}$	$\frac{p+1}{3}-1$	$\frac{p+1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 5(mod\ 6)$ $t \equiv 0,3(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 5(mod\ 6)$ $t \equiv 1(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$	$\frac{q-1}{3}$
$s \equiv 5(mod\ 6)$ $t \equiv 2(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$
$s \equiv 5(mod\ 6)$ $t \equiv 4(mod\ 6)$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{p-1}{3}+1$	$\frac{q-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$
$s \equiv 5(mod\ 6)$ $t \equiv 5(mod\ 6)$	$\frac{p-1}{3}+1$	$\frac{p-1}{3}$	$\frac{p-1}{3}$	$\frac{q+1}{3}-1$	$\frac{q+1}{3}$	$\frac{q+1}{3}$

From the table 3, we find that $|\nu_\sigma(i) - \nu_\sigma(j)| \le 1$ and $|e_\mu(i) - e_\mu(j)| \le 1$ for $i, j \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}$ which satisfies the condition of fuzzy quotient - 3 cordial labeling. Hence we concluded that the graph $S^2(\mathcal{J}_{4,6})$ is fuzzy quotient - 3 cordial.

Theorem 3.4. The generalised subdivision Jahangir graph $S(\mathcal{J}_{s,t})$ is fuzzy quotient-3 cordial graph, for $s \ge 2$ and $t \ge 2$..

Proof: Let G be the $S(\mathcal{J}_{s,t})$ graph. $V(S(\mathcal{J}_{s,t})) = \{c_i: 1 \le i \le st\} \cup \{c\} \cup \{d_i: 1 \le i \le t\}$ and $E(S(\mathcal{J}_{s,t})) = \{c_i c_{i+1}: 1 \le i \le st - 1\} \cup \{c_1 c_{st}\} \cup \{cd_j: 1 \le j \le t\} \cup \{d_j c_{s(j-1)+1}: 1 \le j \le t\}$. $p = st + t + 1$ and $q = st + 2t$. To define $\sigma: V(S(\mathcal{J}_{s,t})) \to [0,1]$ the following cases are to be considered.

Case 1: $s \equiv 0,3(mod\ 6)$

$\sigma(c) = 0.2$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 1(mod\ 3)$	$1 \le j \le t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0(mod\ 3)$	$1 \le j \le t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 2(mod\ 3)$	$1 \le j \le t$

If $k \equiv 1,2(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$

If $k \equiv 0(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$

Case 2: $s \equiv 1,4(mod\ 6)$

Subcase 2.1: $t \equiv 0(mod\ 6)$

$\sigma(c) = 0.2$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 1(mod\ 3)$	$1 \le j \le t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0(mod\ 3)$	$1 \le j \le t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 2(mod\ 3)$	$1 \le j \le t$

If $k \equiv 1,2(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$

If $k \equiv 0(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$

Subcase 2.2: $t \equiv 1(mod\ 6)$

$\sigma(c) = 0.2$		
$\sigma(d_j) = 0.1$	$if\ i \equiv 1(mod\ 3)$	$1 \le j \le t$
$\sigma(d_j) = 0.2$	$if\ i \equiv 0(mod\ 3)$	$1 \le j \le t$
$\sigma(d_j) = 0.3$	$if\ i \equiv 2(mod\ 3)$	$1 \le j \le t$

If $k \equiv 1,2(mod\ 3), 1 \le k \le t$

$\sigma(c_{s(k-1)+i}) = 0.1$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(c_{s(k-1)+i}) = 0.3$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.1$	$if\ i \equiv 0(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.2$	$if\ i \equiv 2(mod\ 3)$	$1 \le i \le s$
$\sigma(e_{s(k-1)+i}) = 0.3$	$if\ i \equiv 1(mod\ 3)$	$1 \le i \le s$

If $k \equiv 0(mod\ 3), 1 \leq k \leq t$

$\sigma(c_{s(k-1)+i}) = 0.1$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq s$

Subcase 2.3: $t \equiv 2(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1$ $if\ i \equiv 0,1(mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $if\ i \equiv 2,3(mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $if\ i \equiv 4,5(mod\ 6)$ $1 \leq j \leq t$
$\sigma(c_{s(k-1)+i}) = 0.1$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.2$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s$
$\sigma(c_{s(k-1)+i}) = 0.3$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.1$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.2$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s$
$\sigma(e_{s(k-1)+i}) = 0.3$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s$

Subcase 2.4: $t \equiv 3(mod\ 6)$

$\sigma(c) = 0.2$
$\sigma(d_j) = 0.1$ $if\ i \equiv 2(mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $if\ i \equiv 0(mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $if\ i \equiv 1(mod\ 3)$ $1 \leq j \leq t$
$\sigma(c_i) = 0.1$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq st$
$\sigma(e_i) = 0.1$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq st$
$\sigma(e_i) = 0.2$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq st$
$\sigma(e_i) = 0.3$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq st$

Subcase 2.5: $t \equiv 4(mod\ 6)$

$\sigma(c) = 0.2$
$\sigma(d_j) = 0.1$ $if\ i \equiv 2(mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $if\ i \equiv 0(mod\ 3)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $if\ i \equiv 1(mod\ 3)$ $1 \leq j \leq t$
$\sigma(c_i) = 0.1$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq st$
$\sigma(e_i) = 0.1$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq st$
$\sigma(e_i) = 0.2$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq st$
$\sigma(e_i) = 0.3$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq st$

Subcase 2.6: $t \equiv 5(mod\ 6)$

$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ $if\ i \equiv 2,4(mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $if\ i \equiv 0,1(mod\ 6)$ $1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $if\ i \equiv 3,5(mod\ 6)$ $1 \leq j \leq t$
$\sigma(c_i) = 0.1$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.2$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.3$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.1$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.2$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.3$ $if\ i \equiv 0(mod\ 3)$ $1 \leq i \leq s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1$ $if\ i \equiv 2(mod\ 3)$ $1 \leq i \leq s$
$\sigma(c_{s(t-1)+i}) = 0.2$ $if\ i \equiv 1(mod\ 3)$ $1 \leq i \leq s$

$\sigma(c_{s(t-1)+i}) = 0.3$ $\quad if\ i \equiv 0(mod\ 3)$ $\quad 1 \leq i \leq s$
$\sigma(e_{s(t-1)+i}) = 0.1$ $\quad if\ i \equiv 2(mod\ 3)$ $\quad 1 \leq i \leq s$
$\sigma(e_{s(t-1)+i}) = 0.2$ $\quad if\ i \equiv 0(mod\ 3)$ $\quad 1 \leq i \leq s$
$\sigma(e_{s(t-1)+i}) = 0.3$ $\quad if\ i \equiv 1(mod\ 3)$ $\quad 1 \leq i \leq s$

Case 3:$s \equiv 2,5(mod\ 6)$

Subcase 3.1:$t \equiv 0(mod\ 6)$

$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 1,2(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 0,5(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(e_i) = 0.1$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(e_i) = 0.2$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq st$
$\sigma(e_i) = 0.3$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq st$

Subcase 3.2:$t \equiv 1(mod\ 6)$

$\sigma(c) = 0.3$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 1,2(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 0,5(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \leq j \leq t$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.1$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.2$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.3$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s$
$\sigma(c_{s(t-1)+i}) = 0.2$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s$
$\sigma(c_{s(t-1)+i}) = 0.3$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s$
$\sigma(e_{s(t-1)+i}) = 0.1$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s$
$\sigma(e_{s(t-1)+i}) = 0.2$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s$
$\sigma(e_{s(t-1)+i}) = 0.3$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s$

Subcase 3.3:$t \equiv 2(mod\ 6)$

$\sigma(c) = 0.1$
$\sigma(d_j) = 0.1$ $\quad if\ i \equiv 1,2(mod\ 6)$ $\quad 1 \leq j \leq t-2$
$\sigma(d_j) = 0.2$ $\quad if\ i \equiv 0,5(mod\ 6)$ $\quad 1 \leq j \leq t-2$
$\sigma(d_j) = 0.3$ $\quad if\ i \equiv 3,4(mod\ 6)$ $\quad 1 \leq j \leq t-2$
$\sigma(d_{t-1}) = 0.2, \sigma(d_t) = 0.3$
$\sigma(c_i) = 0.1$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.2$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(c_i) = 0.3$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.1$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.2$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(e_i) = 0.3$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s(t-1)$
$\sigma(c_{s(t-1)+i}) = 0.1$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s-1$
$\sigma(c_{s(t-1)+i}) = 0.2$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s-1$
$\sigma(c_{s(t-1)+i}) = 0.3$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s-1$
$\sigma(e_{s(t-1)+i}) = 0.1$ $\quad if\ i \equiv 0(mod\ 6)$ $\quad 1 \leq i \leq s-1$
$\sigma(e_{s(t-1)+i}) = 0.2$ $\quad if\ i \equiv 1(mod\ 6)$ $\quad 1 \leq i \leq s-1$
$\sigma(e_{s(t-1)+i}) = 0.3$ $\quad if\ i \equiv 2(mod\ 6)$ $\quad 1 \leq i \leq s-1$
$\sigma(e_{st}) = 0.1$

Subcase 3.4:$t \equiv 3(mod\ 6)$

$\sigma(c) = 0.2$

$\sigma(d_j)=0.1$ $\quad if\ i\equiv 2(mod\ 3)$ $\quad 1\le j\le t$
$\sigma(d_j)=0.2$ $\quad if\ i\equiv 0(mod\ 3)$ $\quad 1\le j\le t$
$\sigma(d_j)=0.3$ $\quad if\ i\equiv 1(mod\ 3)$ $\quad 1\le j\le t$
$\sigma(c_i)=0.1$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 1\le i\le st$
$\sigma(c_i)=0.2$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 1\le i\le st$
$\sigma(c_i)=0.3$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 1\le i\le st$
$\sigma(e_i)=0.1$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 1\le i\le st$
$\sigma(e_i)=0.2$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 1\le i\le st$
$\sigma(e_i)=0.3$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 1\le i\le st$

Subcase 3.5: $t\equiv 4(mod\ 6)$

$\sigma(c)=0.1$
$\sigma(d_j)=0.1$ $\quad if\ i\equiv 1,2(mod\ 6)$ $\quad 1\le j\le t-4$
$\sigma(d_j)=0.2$ $\quad if\ i\equiv 0,5(mod\ 6)$ $\quad 1\le j\le t-4$
$\sigma(d_j)=0.3$ $\quad if\ i\equiv 3,4(mod\ 6)$ $\quad 1\le j\le t-4$

$\sigma(d_{t-3})=0.2$, $\sigma(d_{t-2})=0.3$, $\sigma(d_{t-1})=0.3$, $\sigma(d_t)=0.2$

$\sigma(c_i)=0.1$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 1\le i\le s(t-1)$
$\sigma(c_i)=0.2$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 1\le i\le s(t-1)$
$\sigma(c_i)=0.3$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 1\le i\le s(t-1)$
$\sigma(e_i)=0.1$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 1\le i\le s(t-1)$
$\sigma(e_i)=0.2$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 1\le i\le s(t-1)$
$\sigma(e_i)=0.3$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 1\le i\le s(t-1)$
$\sigma(c_{s(t-1)+1})=0.2$
$\sigma(c_{s(t-1)+i})=0.1$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 2\le i\le s$
$\sigma(c_{s(t-1)+i})=0.2$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 2\le i\le s$
$\sigma(c_{s(t-1)+i})=0.3$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 2\le i\le s$
$\sigma(e_{s(t-1)+i})=0.1$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 2\le i\le s$
$\sigma(e_{s(t-1)+i})=0.2$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 2\le i\le s$
$\sigma(e_{s(t-1)+i})=0.3$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 2\le i\le s$

Subcase 3.6: $t\equiv 5(mod\ 6)$

$\sigma(c)=0.3$
$\sigma(d_j)=0.1$ $\quad if\ i\equiv 1,2(mod\ 6)$ $\quad 1\le j\le t-5$
$\sigma(d_j)=0.2$ $\quad if\ i\equiv 0,5(mod\ 6)$ $\quad 1\le j\le t-5$
$\sigma(d_j)=0.3$ $\quad if\ i\equiv 3,4(mod\ 6)$ $\quad 1\le j\le t-5$

$\sigma(d_{t-4})=0.1$, $\sigma(d_{t-3})=0.2$, $\sigma(d_{t-2})=0.1$, $\sigma(d_{t-1})=0.2$, $\sigma(d_t)=0.1$

$\sigma(c_i)=0.1$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 1\le i\le st-1$
$\sigma(c_i)=0.2$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 1\le i\le st-1$
$\sigma(c_i)=0.3$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 1\le i\le st-1$
$\sigma(e_i)=0.1$ $\quad if\ i\equiv 1(mod\ 6)$ $\quad 1\le i\le st-1$
$\sigma(e_i)=0.2$ $\quad if\ i\equiv 0(mod\ 6)$ $\quad 1\le i\le st-1$
$\sigma(e_i)=0.3$ $\quad if\ i\equiv 2(mod\ 6)$ $\quad 1\le i\le st-1$
$\sigma(e_{st})=0.3$

Table.4. $v_\sigma(i)$ *and* $e_\mu(i)$) *for the graph* $S(\mathcal{J}_{s,t})$, $i\in\{\frac{r}{10}, r\in Z_4-\{0\}\}$.

Nature of s and t	$v_\sigma(0.1)$	$v_\sigma(0.2)$	$v_\sigma(0.3)$	$e_\mu(0.1)$	$e_\mu(0.2)$	$e_\mu(0.3)$
$s\equiv 0,3(mod\ 6)$ $t\equiv 0(mod\ 3)$	$\frac{p}{3}+1$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s\equiv 0,3(mod\ 6)$ $t\equiv 1(mod\ 3)$	$\frac{p}{3}+1$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$
$s\equiv 0,3(mod\ 6)$ $t\equiv 2(mod\ 3)$	$\frac{p}{3}+1$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s\equiv 2,5(mod\ 6)$ $t\equiv 0(mod\ 3)$	$\frac{p}{3}+1$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$

$s \equiv 2,5(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}$	$\frac{p+1}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 2,5(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p+2}{3}$	$\frac{p+2}{3}-1$	$\frac{p+2}{3}$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 1,4(mod\ 6)$ $t \equiv 0(mod\ 3)$	$\frac{p}{3}$	$\frac{p}{3}$	$\frac{p}{3}+1$	$\frac{q}{3}$	$\frac{q}{3}$	$\frac{q}{3}$
$s \equiv 1,4(mod\ 6)$ $t \equiv 1(mod\ 3)$	$\frac{p+2}{3}$	$\frac{p+2}{3}-1$	$\frac{p+2}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}$	$\frac{q+1}{3}-1$
$s \equiv 1,4(mod\ 6)$ $t \equiv 2(mod\ 3)$	$\frac{p+1}{3}$	$\frac{p+1}{3}$	$\frac{p+1}{3}$	$\frac{q-1}{3}$	$\frac{q-1}{3}+1$	$\frac{q-1}{3}$

From the table 4, we find that $|v_\sigma(i) - v_\sigma(j)| \leq 1$ and $|e_\mu(i) - e_\mu(j)| \leq 1$ for $i, j \in \{\frac{r}{10}, r \in Z_4 - \{0\}\}$ which satisfies the condition of fuzzy quotient - 3 cordial labeling. Hence we concluded that the graph $S(\mathcal{J}_{s,t})$ is fuzzy quotient - 3 cordial.

4. Conclusion

In this work we have discussed and established the existence of fuzzy quotient-3 cordial labeling on the generalized Jahangir graph $\mathcal{J}_{s.t}$and its subdivision graphs$S^1(\mathcal{J}_{s,t})$, $S^2(\mathcal{J}_{s,t})$and $S(\mathcal{J}_{s,t})$for $s \geq 2$ and $t \geq 2$. Investigating the existencefuzzy quotient-3 cordial labeling concept on other families of graphs and finding the application of this labeling will be our future.

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