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# Locating And Location Number

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## Abstract

In this article, some notions about set, weight of set, number, number's position, special vertex are introduced. Some classes of graph under these new notions have been opted as if the study on the special attributes of these new notion when they've acted amid each other is considered. Internal and external relations amid these new notions have been obtained as if some classes of graphs in the matter of these notions are been pointed out.

**Keywords:** Special Set, Set's Weight, Special Number, Number's Position.
**AMS Subject Classification:** 05C17, 05C22, 05E45, 05E14

## 1 Preliminary On The Concept

I'm going to refer to some books which are cited to the necessary and sufficient material which are covering the introduction and the preliminary of this outlet so look [**Ref.** [1], **Ref.** [2], **Ref.** [3], **Ref.** [4]] where **Ref.** [1] is about the textbook, **Ref.** [2] is common, **Ref.** [3] has good ideas and **Ref.** [4] is kind of disciplinary approaches in the good ways. Further references could be referred and could be addressed in **Refs.** [5–11].

## 2 Definition And Its Clarification

**Definition 2.1.** Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a graph. Then

- $\mathcal{B}$ is renamed to be **LOCATING SET** if $\forall x \in \mathcal{V}$, there is $m \in \mathcal{B}$ such that $x \cap \mathcal{N}(m) \neq \emptyset$ or $\mathcal{N}(\mathcal{B}) = \mathcal{V}$;
- Minimum cardinality $\mathcal{B}$ is renamed to **LOCATION NUMBER**;
- $\mathcal{B}$'s member is renamed to **LOCATING MEMBER**;
- Cardinality of $\mathcal{B}$ is renamed to **LOCATING NUMBER**.



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## 3 Relationships And Its illustrations

**Theorem 3.1.** *Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a complete graph. Then*

- *$\mathcal{B} = \{m\}$ is renamed to be **LOCATING SET** because $\forall x \in \mathcal{V}$, there is $m \in \mathcal{B}$ such that $x \cap \mathcal{N}(m) \neq \emptyset$ and $\mathcal{N}(\mathcal{B}) = \mathcal{V}$.*
- *Minimum cardinality $\mathcal{B}$, 1 is renamed to **LOCATION NUMBER**.*
- *$\mathcal{B}$'s member $m \in \mathcal{V}$ is renamed to **LOCATING MEMBER**;*
- *Cardinality of $\mathcal{B}$, $1, 2, \cdots \mathcal{O}(\mathcal{G})$ is renamed to **LOCATING NUMBER**.*

**Theorem 3.2.** *Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a complete bipartite graph. Then*

- *$\mathcal{B} = \{m_1 \in \mathcal{V}_1, m_2 \in \mathcal{V}_2\}$ is renamed to be **LOCATING SET** because $\forall x \in \mathcal{V}$ there is $m_1 \in \mathcal{V}_1 \subseteq \mathcal{B}, m_2 \in \mathcal{V}_2 \subseteq \mathcal{B}$ such that $x \cap \mathcal{N}(m) \neq \emptyset$ and $\mathcal{N}(\mathcal{B}) = \mathcal{V}$.*
- *Minimum cardinality $\mathcal{B}$, 2 is renamed to **LOCATION NUMBER**.*
- *$\mathcal{B}$'s member $m_1, m_2 \in \mathcal{V}$ is renamed to **LOCATING MEMBER**;*
- *Cardinality of $\mathcal{B}$, $2, \cdots \mathcal{O}(\mathcal{G})$ is renamed to **LOCATING NUMBER**.*

**Theorem 3.3.** *Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a star graph. Then*

- *$\mathcal{B} = \{m \in \mathcal{V}\}$ is renamed to be **LOCATING SET** because $\forall x \in \mathcal{V}$ there is $m = \mathcal{C}(\mathcal{G}) \subseteq \mathcal{B}$ such that $x \cap \mathcal{N}(m) \neq \emptyset$ and $\mathcal{N}(\mathcal{B}) = \mathcal{V}$.*
- *Minimum cardinality $\mathcal{B}$, 1 is renamed to **LOCATION NUMBER**.*
- *$\mathcal{B}$'s member $m, \{m, m_1, m_2 \cdots, m_{i-1}\}_{i=1}^{i=n}\}$ is renamed to **LOCATING MEMBER**;*
- *Cardinality of $\mathcal{B}$, $1, 2, \cdots \mathcal{O}(\mathcal{G})$ is renamed to **LOCATING NUMBER**.*

**Theorem 3.4.** *Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a wheel graph. Then*

- *$\mathcal{B} = \{m \in \mathcal{V}\}$ is renamed to be **LOCATING SET** because $\forall x \in \mathcal{V}$ there is $m = \mathcal{C}(\mathcal{G}) \subseteq \mathcal{B}$ such that $x \cap \mathcal{N}(m) \neq \emptyset$ and $\mathcal{N}(\mathcal{B}) = \mathcal{V}$.*
- *Minimum cardinality $\mathcal{B}$, 1 is renamed to **LOCATION NUMBER**.*
- *$\mathcal{B}$'s member $m, \{m, m_1, m_2 \cdots, m_{i-1}\}_{i=1}^{i=n}\}$ is renamed to **LOCATING MEMBER**;*
- *Cardinality of $\mathcal{B}$, $1, 2, \cdots \mathcal{O}(\mathcal{G})$ is renamed to **LOCATING NUMBER**.*

**Theorem 3.5.** *Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a path graph. Then*

- *$\mathcal{B} = \{m_2, m_4, \cdots\}$ is renamed to be **LOCATING SET** because $\forall x \in \mathcal{V}$ there is $m \in \mathcal{B}$ such that $x \cap \mathcal{N}(m) \neq \emptyset$ and $\mathcal{N}(\mathcal{B}) = \mathcal{V}$.*
- *Minimum cardinality $\mathcal{B}$, $\frac{\mathcal{O}(\mathcal{G})}{2}$ is renamed to **LOCATION NUMBER**.*
- *$\mathcal{B}$'s member $\{m_2, m_4, \cdots\}$ and $\{m_2, m_4, \cdots\} \cup \{m_1, m_3, \cdots, m_i\}_{i=1}$ is renamed to **LOCATING MEMBER**;*
- *Cardinality of $\mathcal{B}$, $\frac{\mathcal{O}(\mathcal{G})}{2}, \cdots, \mathcal{O}(\mathcal{G})$ is renamed to **LOCATING NUMBER**.*

**Theorem 3.6.** *Let $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ be a cycle graph. Then*

- $\mathcal{B} = \{m_2, m_4, \cdots\}$ *is renamed to be* ***LOCATING SET*** *because* $\forall x \in \mathcal{V}$ *there is* $m \in \mathcal{B}$ *such that* $x \cap \mathcal{N}(m) \neq \emptyset$ *and* $\mathcal{N}(\mathcal{B}) = \mathcal{V}$.
- *Minimum cardinality* $\mathcal{B}$, $\frac{\mathcal{O}(\mathcal{G})}{2}$ *is renamed to* ***LOCATION NUMBER***.
- $\mathcal{B}$*'s member* $\{m_2, m_4, \cdots\}$ *and* $\{m_2, m_4, \cdots\} \cup \{m_1, m_3, \cdots, m_i\}_{i=1}$ *is renamed to* ***LOCATING MEMBER***;
- *Cardinality of* $\mathcal{B}$, $\frac{\mathcal{O}(\mathcal{G})}{2}, \cdots, \mathcal{O}(\mathcal{G})$ *is renamed to* ***LOCATING NUMBER***.

# 4 Results And Its Beyond

**Theorem 4.1.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. If* ***LOCATING MEMBER*** *is one, then one is* ***LOCATION NUMBER***.

**Theorem 4.2.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. If* ***LOCATION NUMBER*** *is two, then* $\mathcal{G}$ *is complete bipartite graph.*

**Theorem 4.3.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. If* ***LOCATION NUMBER*** *is one, then* $\mathcal{G}$ *is either complete graph or star graph.*

**Theorem 4.4.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. Then* $\mathcal{O}(\mathcal{G})$ *is* ***LOCATING NUMBER***.

**Theorem 4.5.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. Then* $\mathcal{V}$ *is* ***LOCATING SET***.

**Theorem 4.6.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. If there is* ***LOCATING SET*** *then the cardinality of its minimal set is* ***LOCATION NUMBER***.

**Theorem 4.7.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph. Then* $1 \leq$ ***LOCATION NUMBER*** $\leq \mathcal{O}(\mathcal{G})$.

**Theorem 4.8.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph.* $\forall m \in \mathcal{V}$, $m$ *is* ***LOCATING MEMBER*** *if and only if* $\mathcal{G}$ *is complete graph.*

**Theorem 4.9.** *Let* $\mathcal{G} : (\mathcal{V}, \mathcal{E})$ *be a graph.* ***LOCATION NUMBER*** *of* $\mathcal{G}$ *is greater than* ***LOCATION NUMBER*** *of its subgraphs.*

**Theorem 4.10.** ***LOCATION NUMBER*** *of union of some graphs equals summation of* ***LOCATION NUMBER*** *of individual graphs.*

**Theorem 4.11.** *Every* ***LOCATING SET*** *of a graph is subset of* $\mathcal{V}$.

**Theorem 4.12.** ***LOCATING SET*** *of a graph is* $\mathcal{V}$ *if and only if graph is empty graph.*

**Theorem 4.13.** ***LOCATING SET*** *of a graph with two partitions as two independent sets is one vertex from each of its partitions as representative if and only if graph is complete bipartite graph.*

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