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Not peer-reviewed version

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Posted Date: 19 July 2021

doi: 10.20944/preprints202107.0410.v1

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Abstract

The aim of this article is to introduce the new notion on a given graph. The notions of valued set, valued function, valued graph and valued quotient are introduced. The attributes of these new notions are studied. Valued set is about the set of vertices which have the maximum number of neighbors. The kind of partition of the vertex set to the vertices of the valued set is introduced and its attributes are studied. The behaviors of classes of graphs under these new notions are studied and the algebraic operations on these sets in the different situations get new result to understand the classes of graphs, these notions and the general graphs better and more.

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AMS Subject Classification: 05C17, 05C22, 05E45, 05E14

1 Outline Of The Background

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. A set $\mathcal{B} \subseteq \mathcal{V}$ is **VALUED SET** if for any of vertex, there's the vertex belongs to $\mathcal{B}$, which cardinality of its neighbors is greater than.

3 Relationships And Its illustrations

Theorem 3.1. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. Then vertices with degree Δ are the members of* ***VALUED SET****.*

Theorem 3.2. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a complete graph. Then the only* ***VALUED SET*** *is V.*

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Theorem 3.3. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. If **VALUED SET** has the cardinality one, then it isn't complete graph and it isn't empty graph.*

Theorem 3.4. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be an empty graph. Then the only **VALUED SET** is V.*

Theorem 3.5. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a complete bipartite graph. Then the minimum part is **VALUED SET**.*

Theorem 3.6. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a complete multipartite graph. Then the minimum part is **VALUED SET**.*

Theorem 3.7. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a complete multipartite graph. The infimum part is **VALUED SET** if and only if it's minimum part.*

Theorem 3.8. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a path graph. Then cardinality of **VALUED SET** is all vertices with the exceptions of two leaves.*

Theorem 3.9. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a cycle graph. Then **VALUED SET** is V.*

4 Results And Its Beyond

Theorem 4.1. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a wheel graph. Then **VALUED SET** is the center of wheel.*

Theorem 4.2. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a star graph. Then **VALUED SET** is the center of star.*

Theorem 4.3. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. Then **VALUED SET** holds the property of union and the property of intersection.*

Theorem 4.4. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. Then **VALUED SET** is increasing property.*

Theorem 4.5. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. Then **VALUED SET** is decreasing property if the set is considered up to be minimal.*

Theorem 4.6. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. If there's a **VALUED SET**, then its complement is **VALUED SET**.*

Theorem 4.7. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. If there's an unique element of **VALUED SET** which has the degree $n-1$, then the cardinality of a **VALUED SET** is one.*

Theorem 4.8. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. If there's an unique element of **VALUED SET** which has the degree $n-1$, then it's the only member of a **VALUED SET**.*

Definition 4.9. Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. An unary operation from $\mathcal{V}$ to a **VALUED SET** is said to be **VALUED FUNCTION**.

Definition 4.10. Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. Then an induced graph of $\mathcal{G}$ is called to be **VALUED GRAPH** and denoted by $\mathcal{VG} = (\mathcal{B}, \mathcal{E})$ if $\mathcal{B} \subseteq \mathcal{V}$ and $\mathcal{B}$ is **VALUED SET**.

Definition 4.11. Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. $\mathcal{R}$ is the relation amid **VALUED SET** if they've same cardinality. And the quotient set $\frac{\mathcal{P}(\mathcal{V})}{\mathcal{R}}$ is said to be **VALUED QUOTIENT**.

Theorem 4.12. *Let $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ be a graph. Then **VALUED GRAPH** holds the property of union.*

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Theorem 4.13. $\frac{\mathcal{P}(\mathcal{V})}{\mathcal{R}} \leq \Delta.$

Theorem 4.14. $(\frac{\mathcal{P}(\mathcal{V})}{\mathcal{R}}, \cup)$ *is a groupoid.*

Theorem 4.15. *Let* $\mathcal{G} = (\mathcal{V}, \mathcal{E})$ *be a graph. Then* ***VALUED GRAPH*** *holds the property* Δ.

Theorem 4.16. *A complete graph holds the property of* ***VALUED GRAPH****.*

Theorem 4.17. *An empty graph holds the property of* ***VALUED GRAPH****.*

Theorem 4.18. *A star graph doesn't hold the property of* ***VALUED GRAPH****.*

Theorem 4.19. *A path graph doesn't hold the property of* ***VALUED GRAPH****.*

Theorem 4.20. *A cycle graph holds the property of* ***VALUED GRAPH****.*

Theorem 4.21. *A wheel graph doesn't hold the property of* ***VALUED GRAPH****.*

Theorem 4.22. *A* ***VALUED GRAPH*** *of star is empty graph from the order one.*

Theorem 4.23. *A* ***VALUED GRAPH*** *of path graph is empty graph from the order* $n - 2$.

Theorem 4.24. *A* ***VALUED GRAPH*** *holds the property of path graph.*

Theorem 4.25. *A* ***VALUED GRAPH*** *of wheel is empty graph from the order one.*

Theorem 4.26. *A* ***VALUED GRAPH*** *of path graph from order three is empty graph from the order one.*

Theorem 4.27. *A* ***VALUED GRAPH*** *of a cycle graph from order three is empty graph from the order one.*

Theorem 4.28. *A* ***VALUED GRAPH*** *of any triangle of any graph from order three is empty graph from the order one.*

Theorem 4.29. *A* ***VALUED GRAPH*** *of a star graph from order three is empty graph from the order one.*

Theorem 4.30. *Let* $\mathcal{U}(\mathcal{V})$ *is the set of all graphs which have the vertex set* $\mathcal{V}$*. Then a set of all* ***VALUED GRAPH*** *has the star graph is identity function amid these two sets.*

Theorem 4.31. *Let* $\mathcal{U}(\mathcal{V})$ *is the set of all graphs which have the vertex set* $\mathcal{V}$*. Then a set of all* ***VALUED GRAPH*** *has the star graph is identity function amid these two sets for every given vertex.*

Theorem 4.32. *For every given vertex, the couple star graph on* $\mathcal{V}$ *with the center of this vertex, and* ***VALUED GRAPH*** *on it, both are an identity function on a given vertex.*

Theorem 4.33. *The combination of two functions star graph and* ***VALUED GRAPH*** *are an identity function on any given vertex of any given graph.*

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