# Research Purposal For Graph theory

In mathematics, graph theory is the study of graphs, which are mathematical structures, used to model pair wise relations between objects. A graph in this context is made up of vertices, nodes, or points which are connected by edges, arcs, or lines.

Definitions

There is large number of definitions in graph theory. The following are some of the more basic ways of defining graphs and related mathematical structure.

Graph

a graph is an ordered pair G = (V, E) consisting of a non-empty set V={v1,v2,v3,...} of vertices or nodes or points together with a set E={e1,e2,e3,...} of edges or arcs or lines, which are 2-element subsets of V
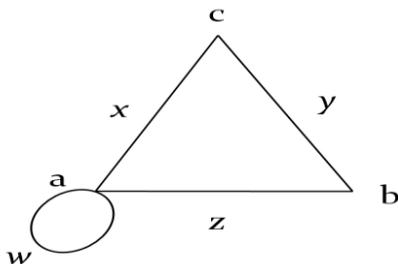

Here vertices are a,b,c and a,b,c $\in$ V
And edges are w,x,y,z and $w,x,y,z \in$ E

The set V(G) is called the **vertex set** of G and E(G) is called the **edge set**. Usually the **Graph** is denoted by G=(V,E) for $u,v \in$V set and $\{u,v\}$ an edge of G. Since $\{u,v\}$ is 2-elements set, we may write $\{v,u\}$.

If $e=uv$ is an edge of G, then we say that u and v are **adjacent** in G and e joins u and v.

For example: A graph G is denoted by the sets
V(G)={ $u, v, w, x, ,z$} and E(G)={ uv, uw, wx, xy, xz}.
Now we have the following graph by considering these sets.
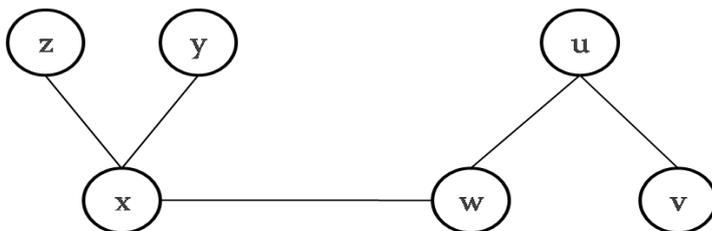
Types of Graphs Methodology

1. Null Graph:
A graph which contains only **isolated node,** is called a null graph

i.e., the set of edges in the graph is empty.

Null graph is denoted on *n* vertices by Nn

N4 is shown in the finger 8.

2.Complete Graph:
A simple graph G is said to be **complete** if every vertex in G is connected with every other vertex.

i.e., If G contains exactly one edge between each pair of distinct vertices.

A complete graph is usually denoted by **Kn.** It should be noted that **Kn** has exactly edges.

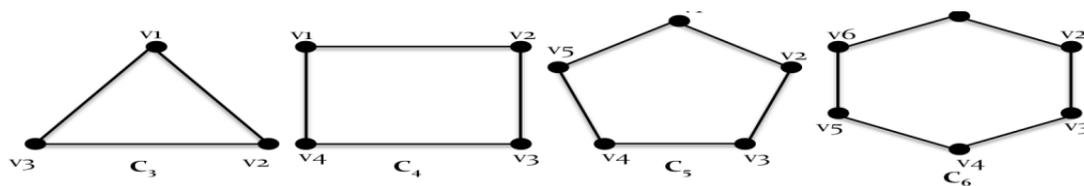The graph **Kn** for **n=** 1, 2, 3,4,5,6 are shown in Fig 9.
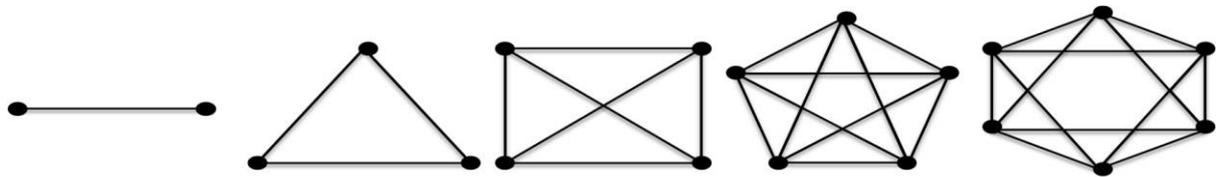
3.Regular Graph:
A graph, in which all the vertices are of E**qual degree,** is called a **Regular Graph.**

If the degree of each vertex is *r*, then the graph is called a regular graph of degree *r*.

4.Cycles:
The cycle **Cn**, consist of *n* vertices *v1 ,v2 , ..., vn* and edges [*v1 ,v2*], [*v2 ,v3*], [*v3 ,v4*],....., [*vn-1 ,vn*].

The cycles **C3 ,C4 ,C5** and **C6** are shown in Fig 10.

5.Wheels:
The wheel **Wn** is obtained when an additional vertex to the cycle Cn, for n≥3, and connect this new vertex to each of the *n* vertices in Cn, by new edges. The wheels W3, W4, W5 and W6 are displayed in the Fig 11.
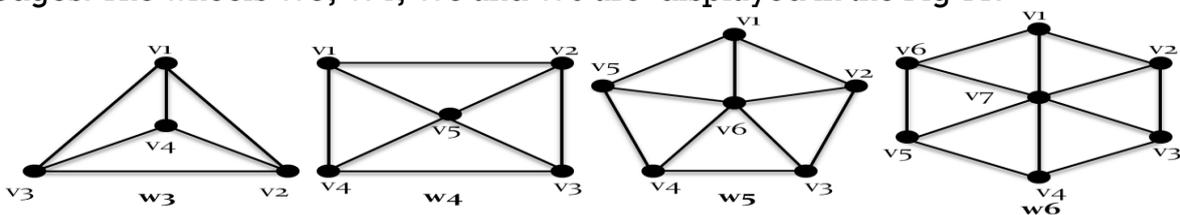
6.Platonic Graph: the graph formed by edges and vertices of five regular(platonic) solids-The tetrahedron, octahedron, cube, dodecahedron and icosahedrons.

Tetrahedron   Octahedron   Cube   Icosahedron   Dodecahedron
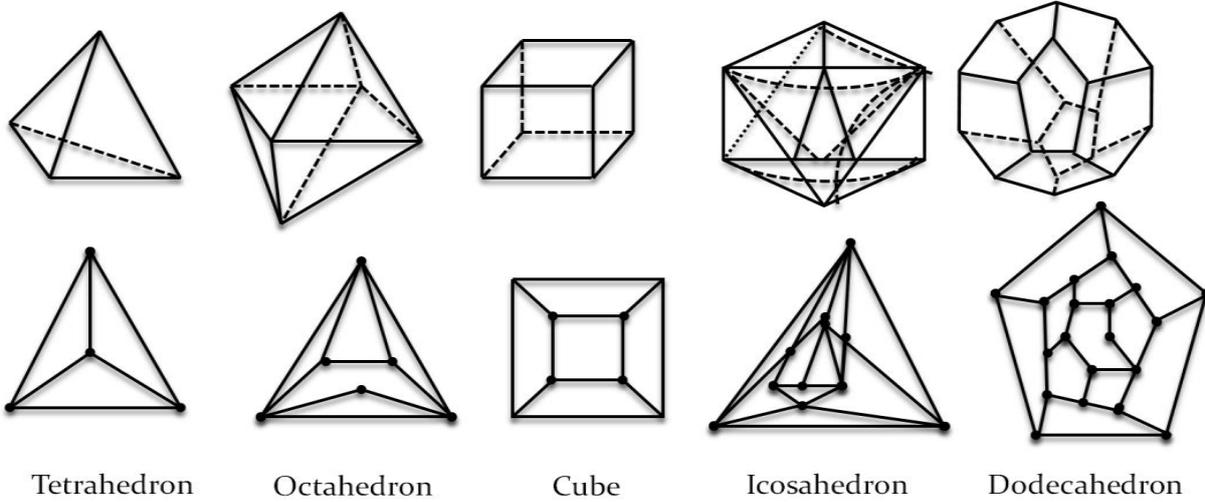
ELEMENTS OF GRAP THEORY TERMINOLOGY

*Loop: an edge of the graph that joins a node to itself is called **loop** or **self-loop** i.e., a loop is an edge (vi, vj) where vi = vj.

*Degree of vertex: The number of edges incident on a vertex vj with self-loops is called the **degree of a vertex vj** and denoted by **degG(vj)** or **deg vj** or **d(vj).**

*Path: An open walk in which no vertex appears more than once is called **path**. The number of edges in the path is called **length of a path**.

*Component: disconnected graph consists of two or more connected graphs. Each of these connected subgraph is called a component.

CONNECTED GRAPH   DISCONNECTED GRAPH