Introduction of Graph Theory

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Introduction

Now-a-days Graph Theory is a very useful branch of mathematics to analyze certain real world problems in

- Physics
- Chemistry
- Communication Science
- Computer Science
- Genetics

Also,it has very closed connections with many branches of mathematics such as matrix theory, group theory, probability, topology, numerical analysis and combinatorics.

Definition of graph

A graph $G = (V, E)$ consists of a set of objects $V = \{v_1, v_2.....\}$ called vertices,and another set $E = \{e_1, e_2, ...\}$ whose elements are called edges, such that each edge e_k is idetified with an unordered pair (v_i, v_j) of vertices.

Figure: Graph

Directed and Undirected Graph

A directed graph $G = (V, E)$ consists of a set of vertices $V = \{v_1, v_2.....\}$,a set of edges $E = \{e_1, e_2, ...\}$ and a mapping φ that maps every edge on to some ordered pair of vertices (v_i, v_j). The edges are directed by an arrow sign.

On the other hand as shown in above Fig. is a undirected graph.

Basic Terminlogies-I

Self loops : If an edge of a graph joins a vertex v_i to itself is called a self loop. v_2 is a self loop as shown in figure

Parallel edge: If there are more than one edge in a graph associated with a given pair of vertices, then these edge is called parallel edge. e_1 and e_2 is a parallel edge of pair of vertices of v_3 and v_4 as shown in Figure

Basic Terminlogies-II

Multigraph: A graph which contains some parallel edge and self loops is called multigraph. Figure 2 is a multigraph.

Simple graph: A graph having no parallel edges and self loops is called a simple graph.