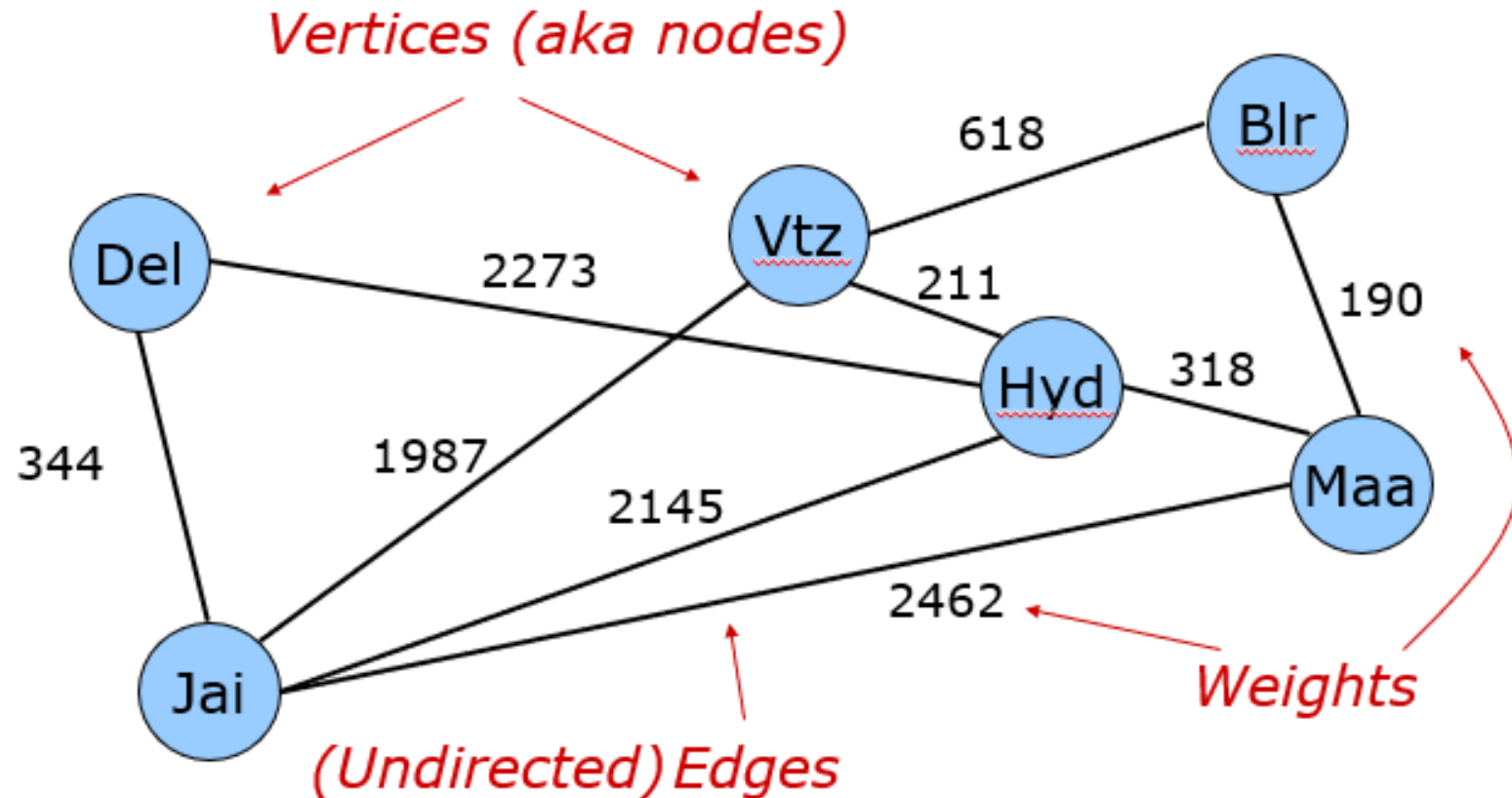**BML MUNJAL UNIVERSITY™**
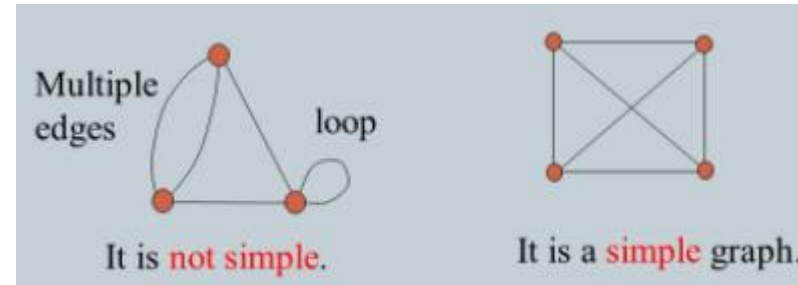
Data Structures & Algorithms

Graph

Graph

A graph represented as G(V, E), consists of two sets
- a finite, nonempty set of vertices V(G)
- a finite, non empty set of edges E(G)
- A graph may also associate to each edge some edge value (cost, capacity, length, etc.).
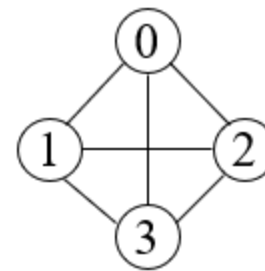
Types of Graph

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

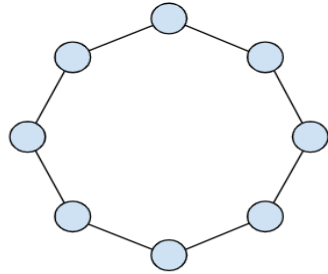Complete graph: a graph in which every vertex is directly connected to every other vertex.
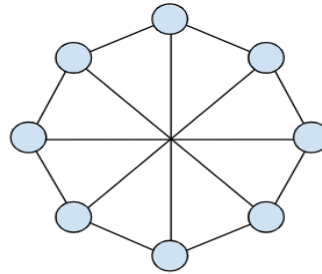

G1

complete graph

Types of Graph

The degree of a vertex is the number of edges incident to that vertex

Regular Graph: A graph is called regular graph if degree of each vertex is equal.
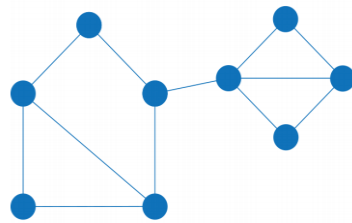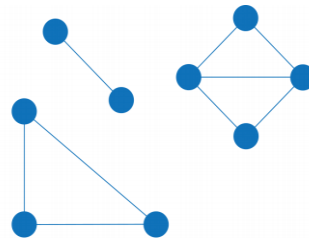

2-regular   3-regular

Connected and Disconnected Graph: A graph is said to be connected if every pair of vertices in the graph is connected. A graph that is not connected is called disconnected.
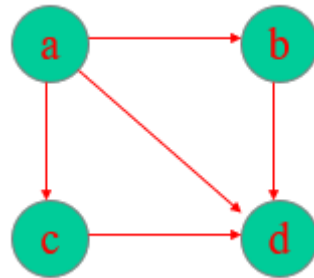

Connected Graph   Disconnected Graph
Includes 3 components.

Types of Graph

A tree is a simple and connected graph with no cycles.

Undirected: When the edges in a graph have no direction, the graph is called undirected (or ugraph).

Directed: When the edges in a graph have a direction, the graph is called directed (or digraph).

In a directed graph the vertices have **in-degree** (number of edges incident into the vertex) and **out-degree** (number of edges going out from that vertex).

Unweighted: If the edges do not have weights.
Weighted: Each edge has an associated weight.

Representing graphs

Adjacency matrix
The adjacency matrix is symmetric and a square
matrix with rows and columns labelled
by graph vertices, with a 1 or 0 in position (v_i, v_j)
according to whether v_i and v_j are adjacent or not.

	1	2	3	4	5	6	7
1	0	0	1	1	0	0	0
2	0	0	0	1	1	0	0
3	0	0	0	0	0	1	0
4	0	0	1	0	0	1	1
5	0	0	0	1	0	0	1
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0

Adjacency lists
The adjacency list representation of
a graph consists of n lists one for each vertex v_i.
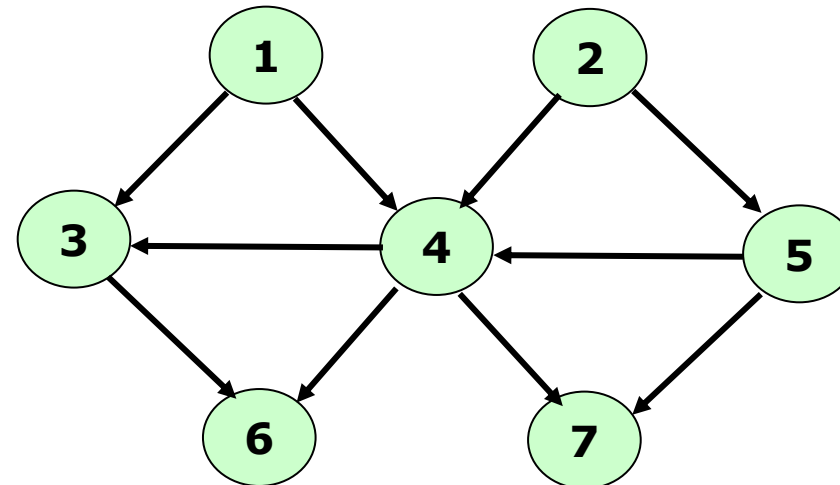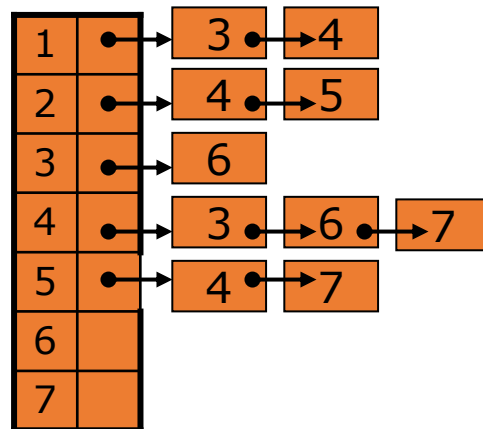
For you to do

Draw the adjacency matrix and adjacency list representations of the following digraph (unweighted).