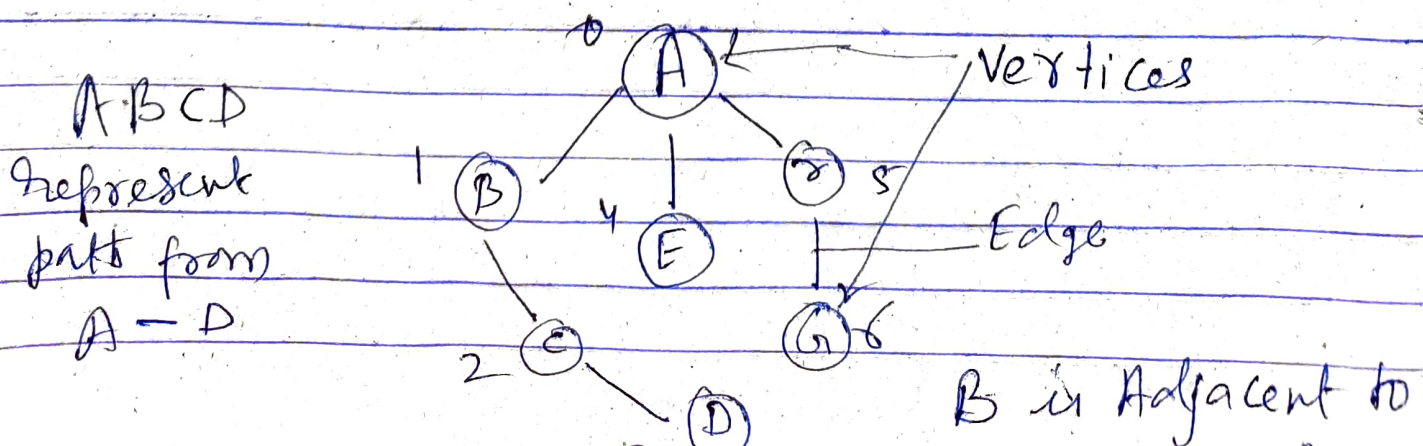# Graph

Concept :-

A Graph data structure consists of a finite set of verticses (also called as nodes or points) together with a set of Edges (also called as links or lines)

In computer science a graph is meant to implement the graph concept from the field of graph theory within mathematics. The main terms related with graph are -

* Vertex - Each node of Graph is represented as a vertex.

* Edge - Edge represents a path between two vertices or a line between two-vertices

* Adjacency - Two nodes or vertices are called adjacent if they are connected to each other through an edge.

* Path - Path represents a sequence of edges between the two vertices

ABCD
represent
path from
A - D

Vertices

Edge

B is Adjacent to

Graphs are used to solve many real-life problems, for example graphs are used to represent network. Graphs may hierarchical or non hierarchical, in addition addition they may be cyclic or non cyclic. The UNIX file and Directory Structure is the best example of Hierarchical cyclic graph.

A Graph can be of two types- Undirected Graph & Directed Graph.

A) Undirected Graph:- A graph which has unordered pair of vertices is called undirected graph like
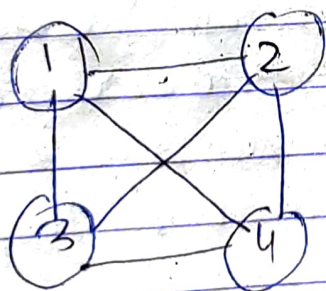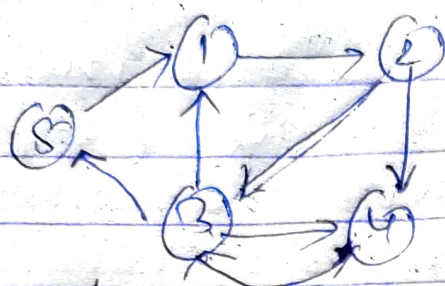

For example The graph G has -
V(G) = {1, 2, 3, 4}
E(G) { (1,2), (1,3), (1,4), (2,3), (2,4), (3,4)}

B) Directed Graph:- A directed graph is a graph which has ordered pair of vertices (V1, V2) where V1 is the tail and V2 is head of edge. In this type of graph each edge has direction. means (V1, V) and (V2, V1) represent different edges; means that a direction will be

associated with that edge.

$V(G) = \{1, 2, 3, 4, 5\}$

$E(G) = \{(1,2), (2,3), (4,3), (4,1), (4,5), (5,1)\}$
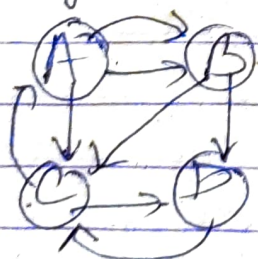
The Graph has 5 vertices an 6 Edges.

The Matrix Representation of Graphs:

Graphs can be stored both as Array and linked list. If stored a array, they are stored in the form of Adjacency Matrix. Adjacency Matrix is matrix which keep the information of Adjacent nodes. In other words we can say that it keeps its information that wether this node is adjacent to any other node or not.
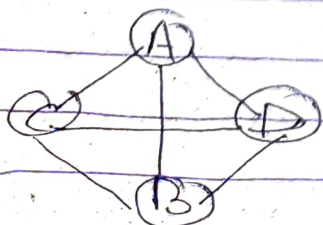
The Matrix to store a graph must be a square matrix because each row nd each colum of the Matrix represents a node. For exe- a grapha having 4 nodes will be stored in a Mat[4][4] as for as given in the figure

Directed

Mat[i][j] will be 1 if there is an edge betwee node i and j and it will be 0 if there is no edge in betwee these two nodes

	A	B	C	D
A	0	1	0	1
B	1	0	1	1
C	0	0	0	1
D	1	0	1	0

Undirecte

	A	B	C	D
A	0	1	1	1
B	1	0	1	1
C	1	1	0	1
D	1	1	1	0