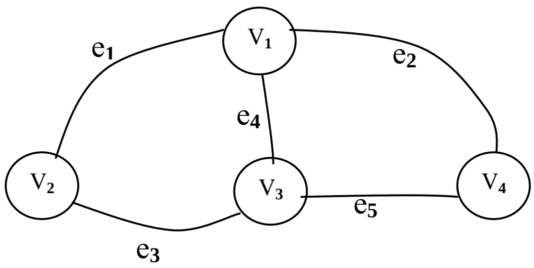
Graphs



Graph A

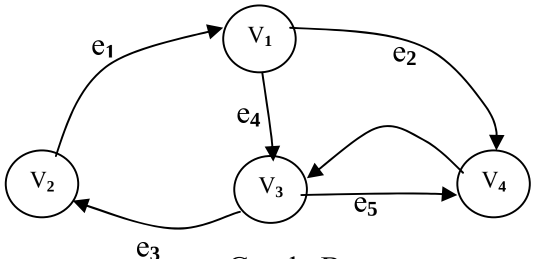
This gra ph has 4 vertices v_1, v_2, v_3, v_4 and 5 edges e_1, e_2, e_3, e_4, e_5

Adjacency matrix of graph A :

$$a_{ij} = \begin{cases} 1 & \text{if graph A has an edge } (i, j) \\ 0 & \text{else} \end{cases}$$

$$\begin{array}{c c} & \begin{array}{cccc} v1 & v2 & v3 & v4 \end{array} \\ \begin{array}{c} v1 \\ v2 \\ v3 \\ v4 \end{array} & \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

Diagraph (directed graph): If the edges have direction it is called **diagraph**



Graph B

Adjacency matrix of a digraph :

$$a_{ij} = \begin{cases} 1 & \text{if graph B has a directed edge } (i, j) \\ 0 & \text{else} \end{cases}$$

from

$$\begin{array}{c c} \downarrow \ \text{To}\rightarrow & \begin{array}{cccc} v1 & v2 & v3 & v4 \end{array} \\ \begin{array}{c} v1 \\ v2 \\ v3 \\ v4 \end{array} & \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

LISTS of GRAPH

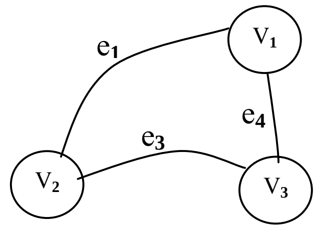
Vertex incidence lists

Vertex	incidence edges
V_1	**e_1, e_2, e_4**
V_2	**e_1, e_3**
V_3	**e_3, e_4, e_5**
V_4	**e_2, e_5**

Edge incidence lists

Edge	Endpoints
e_1	**V_1, V_2**
e_2	**V_1, V_4**
e_3	**V_2, V_3**
e_4	**V_1, V_3**
e_5	**V_3, V_4**

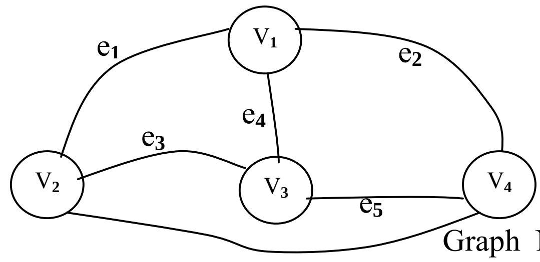
Subgraph: A subgraph of a given graph G(**V**,e) is a graph obtained by deleting some edges and vertices of G(V,e)



Graph M

Graph M is a subgraph of graph A

Complete Graph: Every vertices of G(V,e) is joined by an edge.

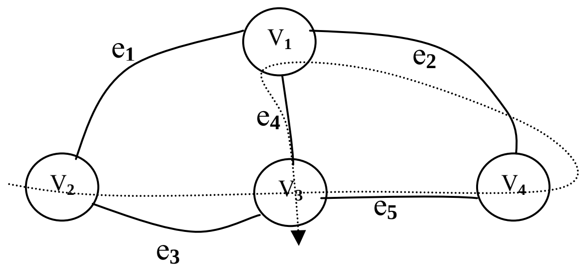


Graph N

Graph N is a complete graph

Graph A, graph M are **sparse(incomplete) graph**

Walk: Random walk from vertex V_K to vertex V_J without any restriction. A walk over V_2-V_3-V_4-V_1-V_3



If a walk ends at the vertex it started it is called a **closed walk**.

Path: walk from vertex V_K to vertex V_J where a vertex is visited **at most** only once. The above walk V_2-V_3-V_4-V_1-V_3 is not a path because V_3 is visited more than once.

Cycle: A closed path is called a Cycle.