Priority Queues

Data structure that allows at least the following two operations:

1. Insert
2. DeleteMin

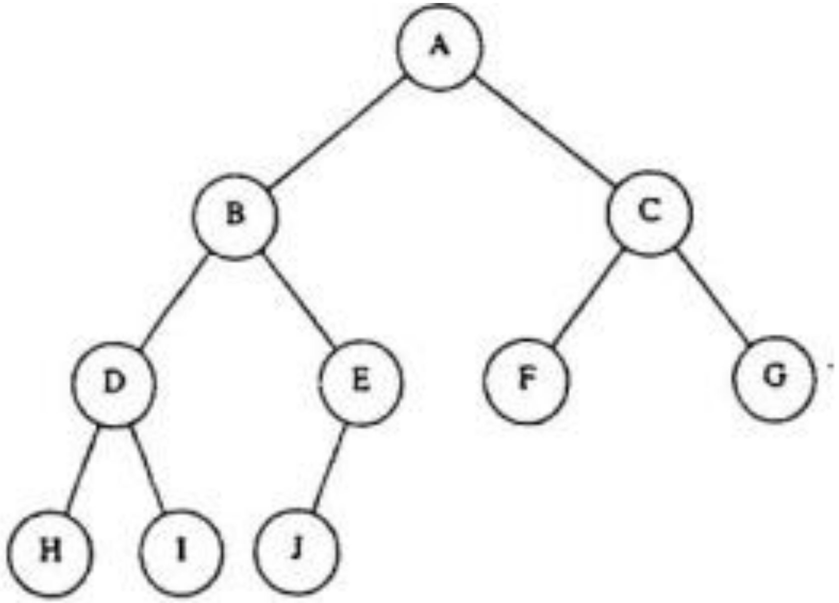
Priority Queues: Simple Implementation

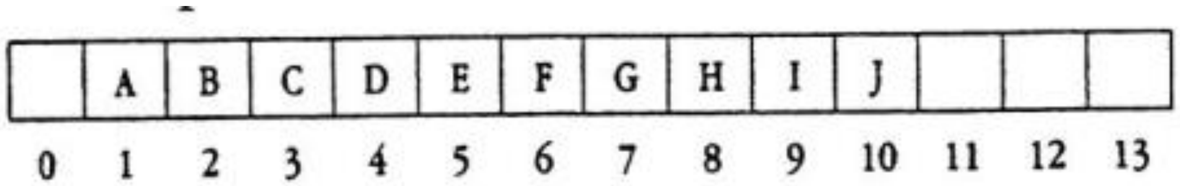
Binary Heap :

Structure Property >> A complete binary tree

It is easy to show that a complete binary heap of height h has between 2^h and $2^{h+1} - 1$ nodes.

Priority Queues: Simple Implementation

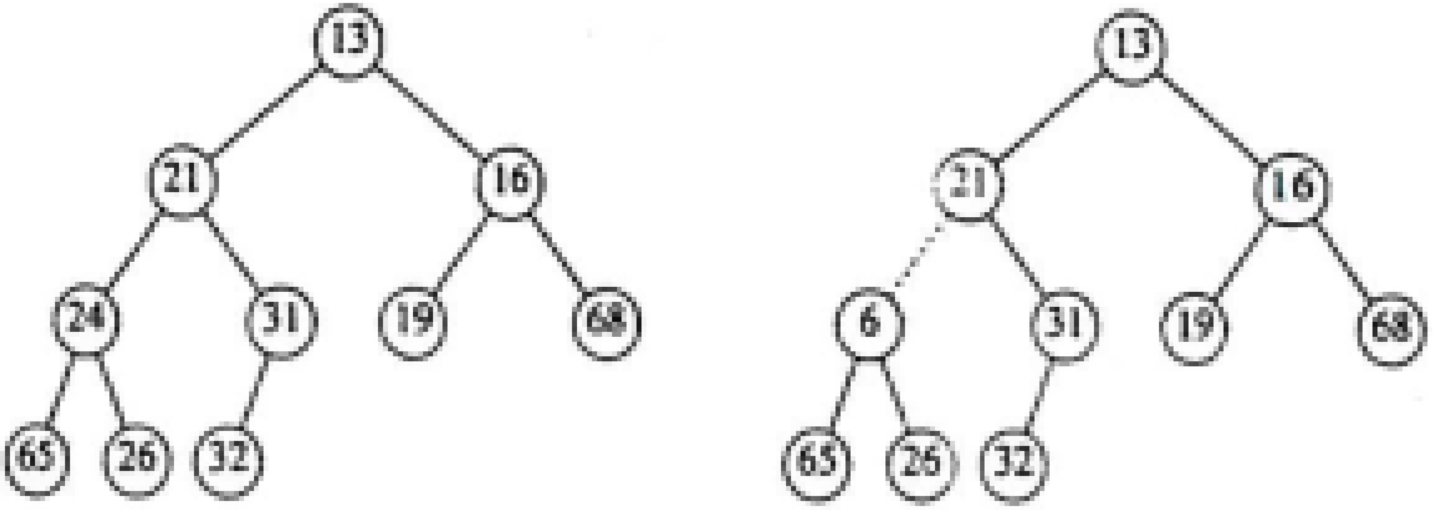




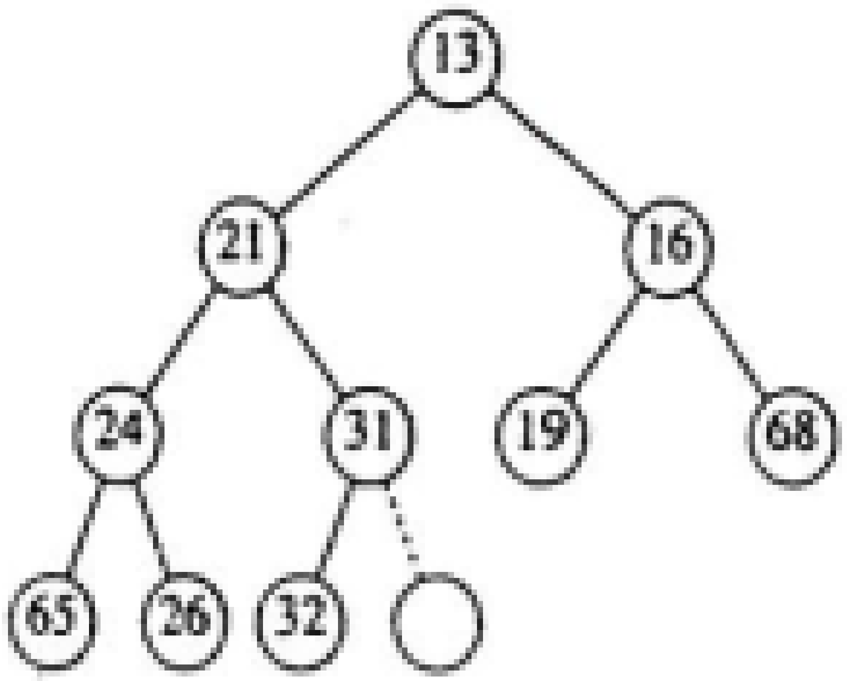
0	1	2	3	4	5	6	7	8	9	10	11	12	13
	A	B	C	D	E	F	G	H	I	J			

Priority Queues: Heap order property

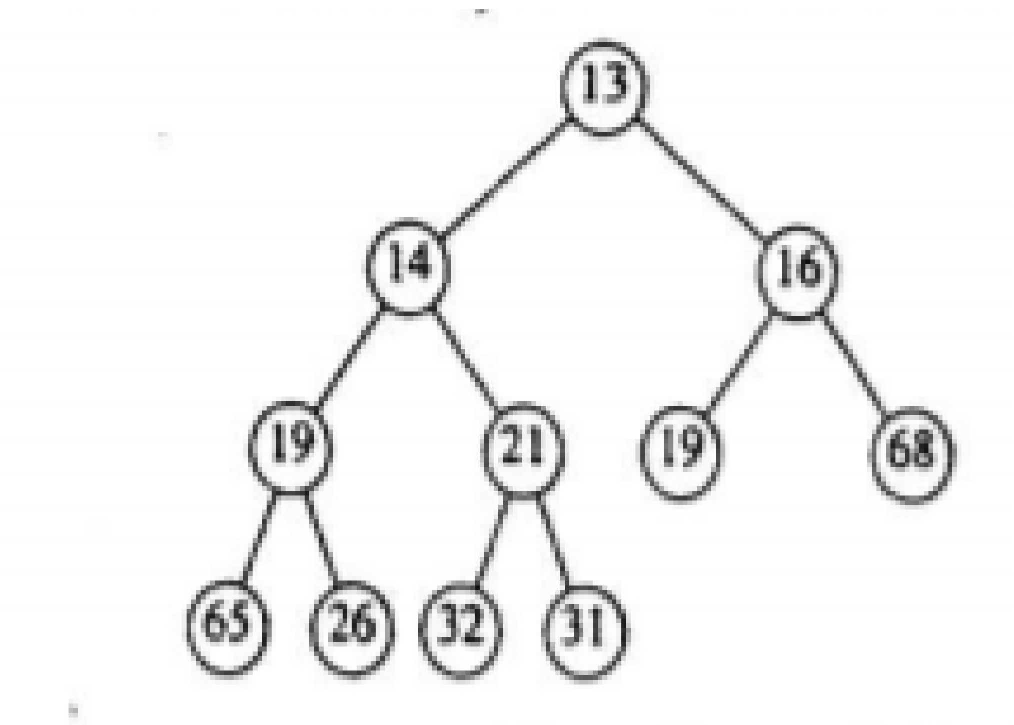
The smallest element should be at the root



Priority Queues: Insert

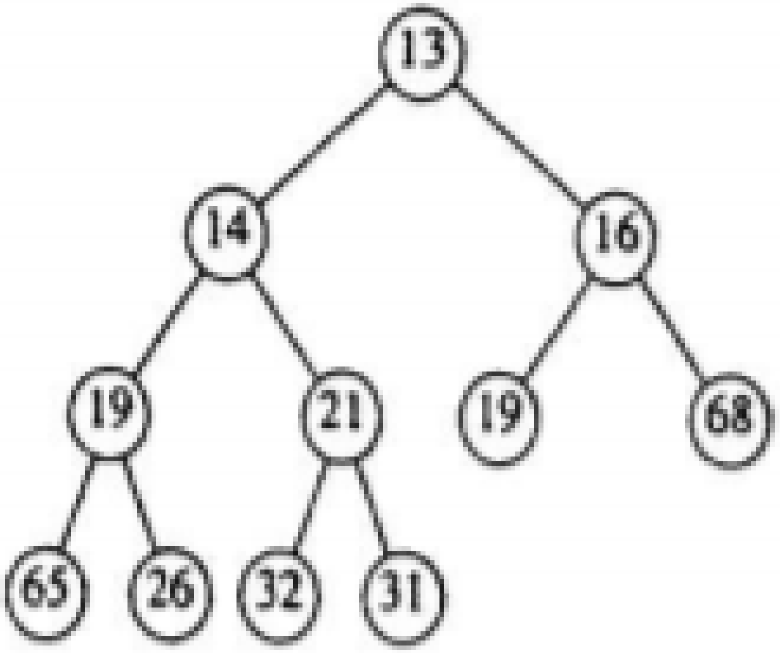


Priority Queues: DeleteMin



Percolate down

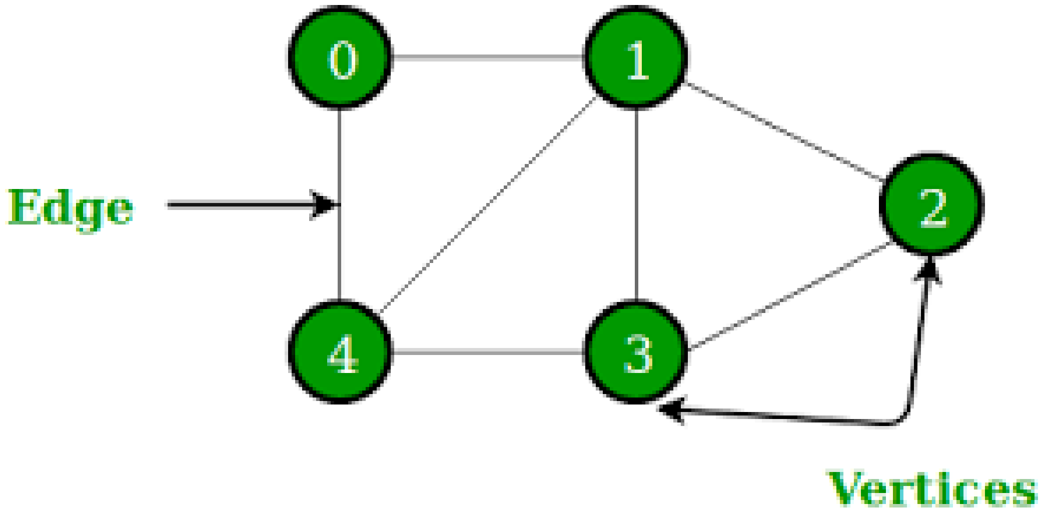
Priority Queues: Build heap



Graph Algorithms

Graph

Graph G=(V,E) consists of a set of vertices or node(V) and a set of edges(E)



Edges

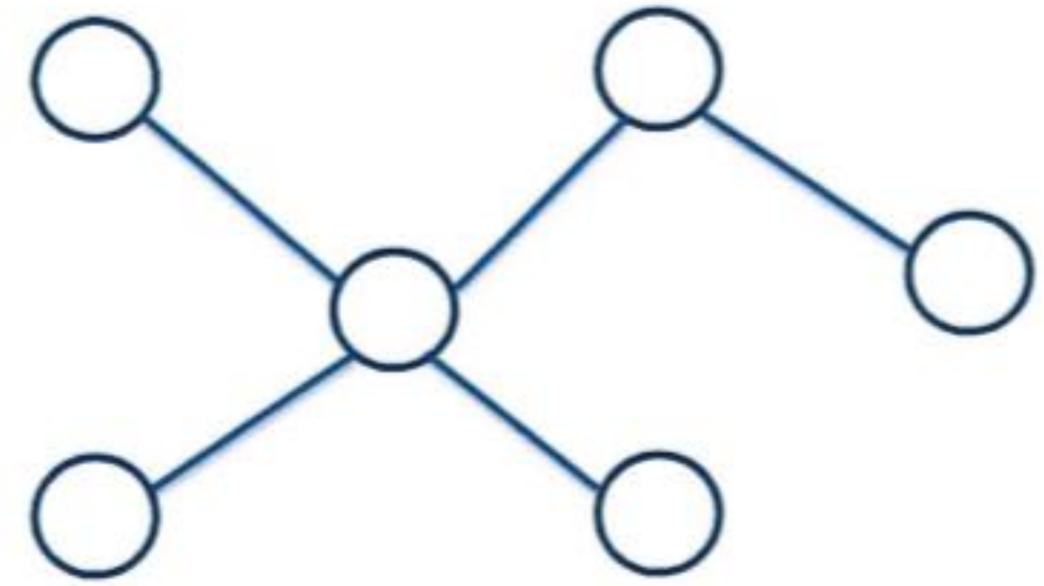
Edges is a pair (v,w)

-Undirected

-Directed

-Weight

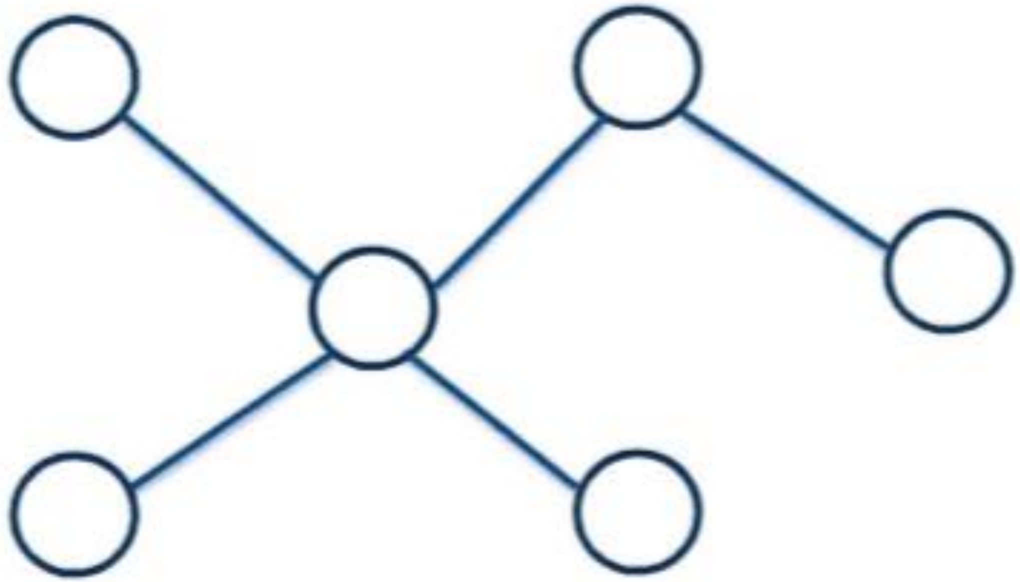
-Unweight



Path

-Unweight

-weighted



Cycle

A cycle in a directed graph is a path of length at lest 1

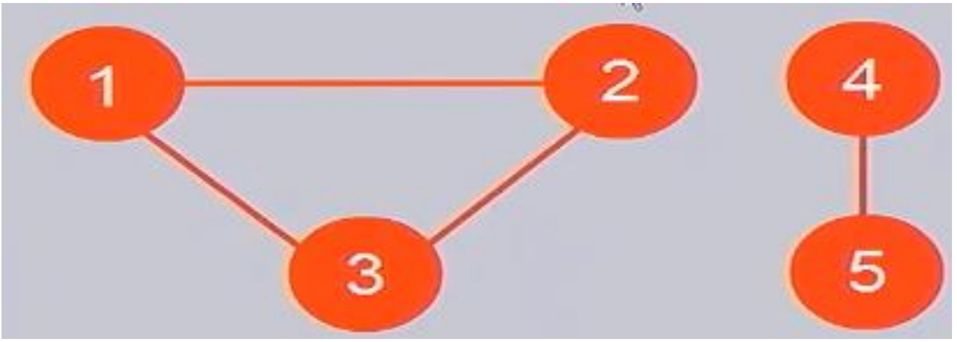
-Acyclic

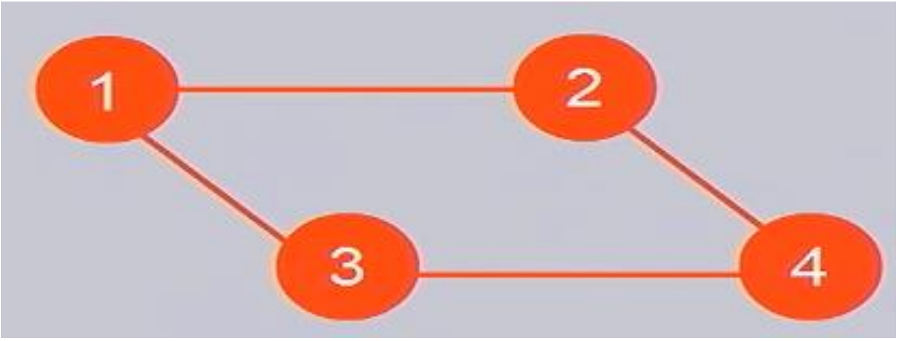
- -Undirected
- -Directed (DAG : Directed Acyclic Graph)

-Cyclic

Connectivity

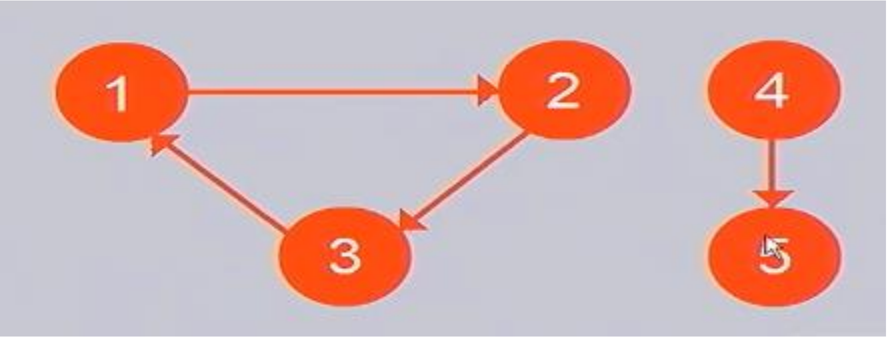
Connected if there is a path from every vertex to every vertex x.

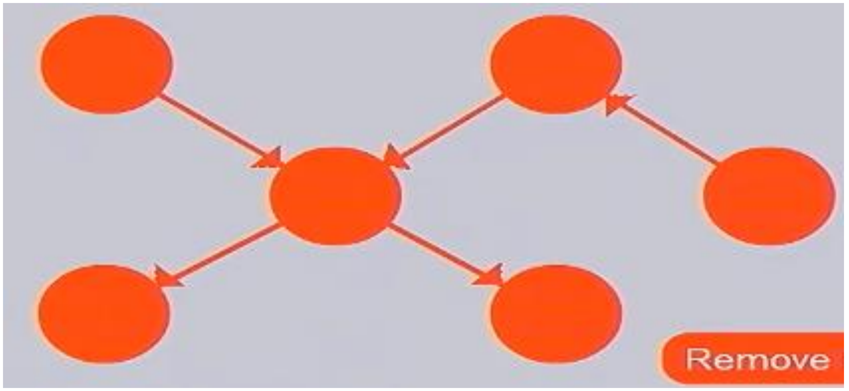




Connectivity

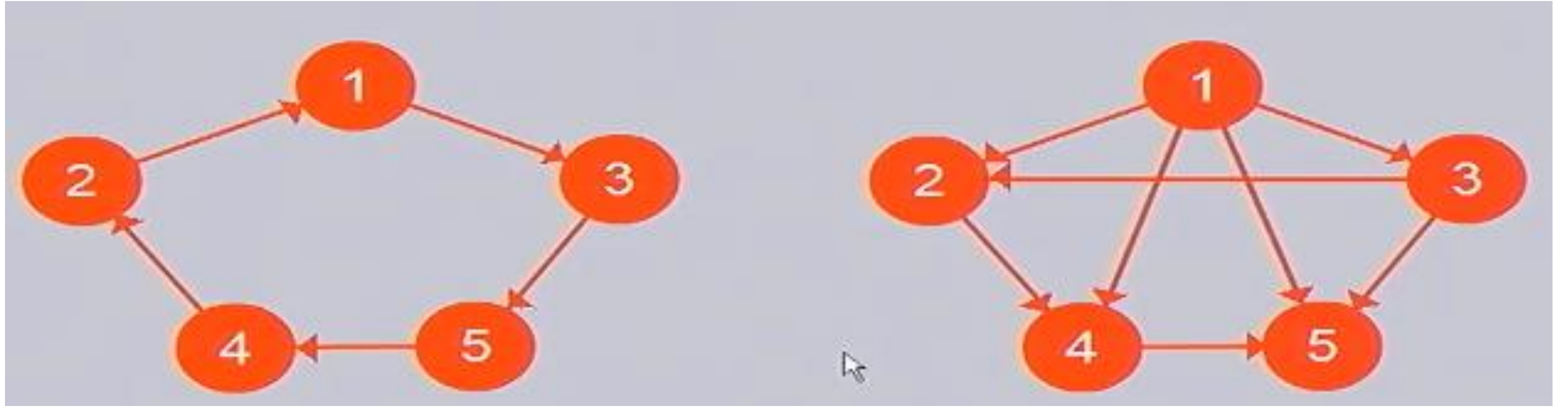
Directed



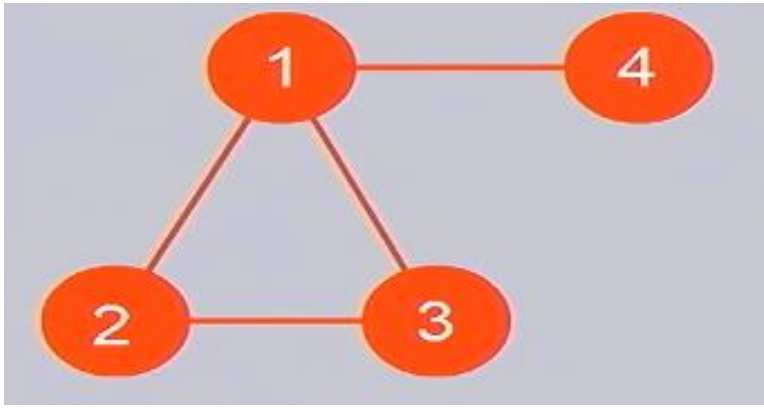


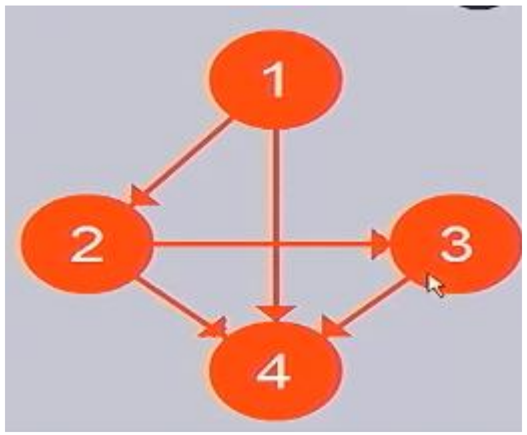
Connectivity

Strongly connected / weakly connected



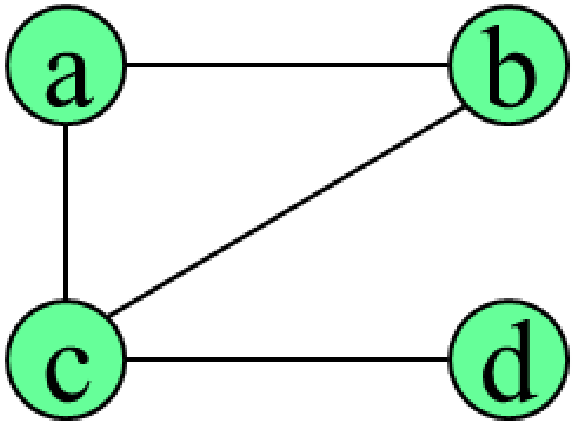
Degree





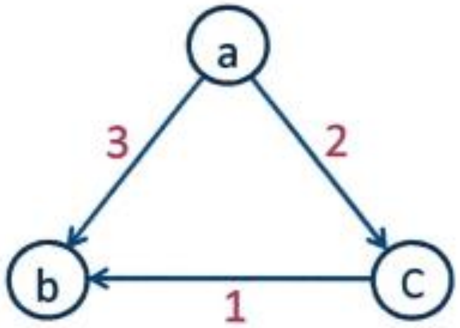
Representation of graphs

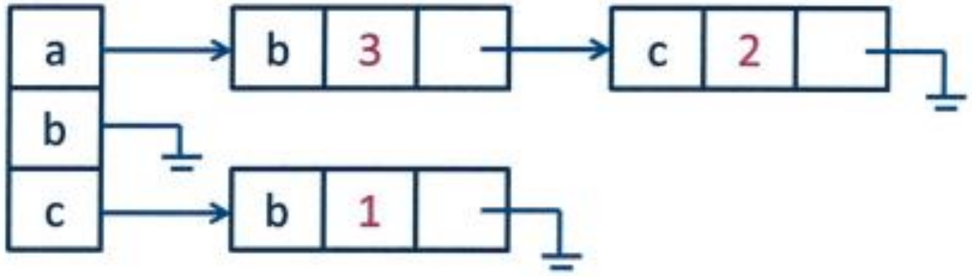
Adjacency matrix



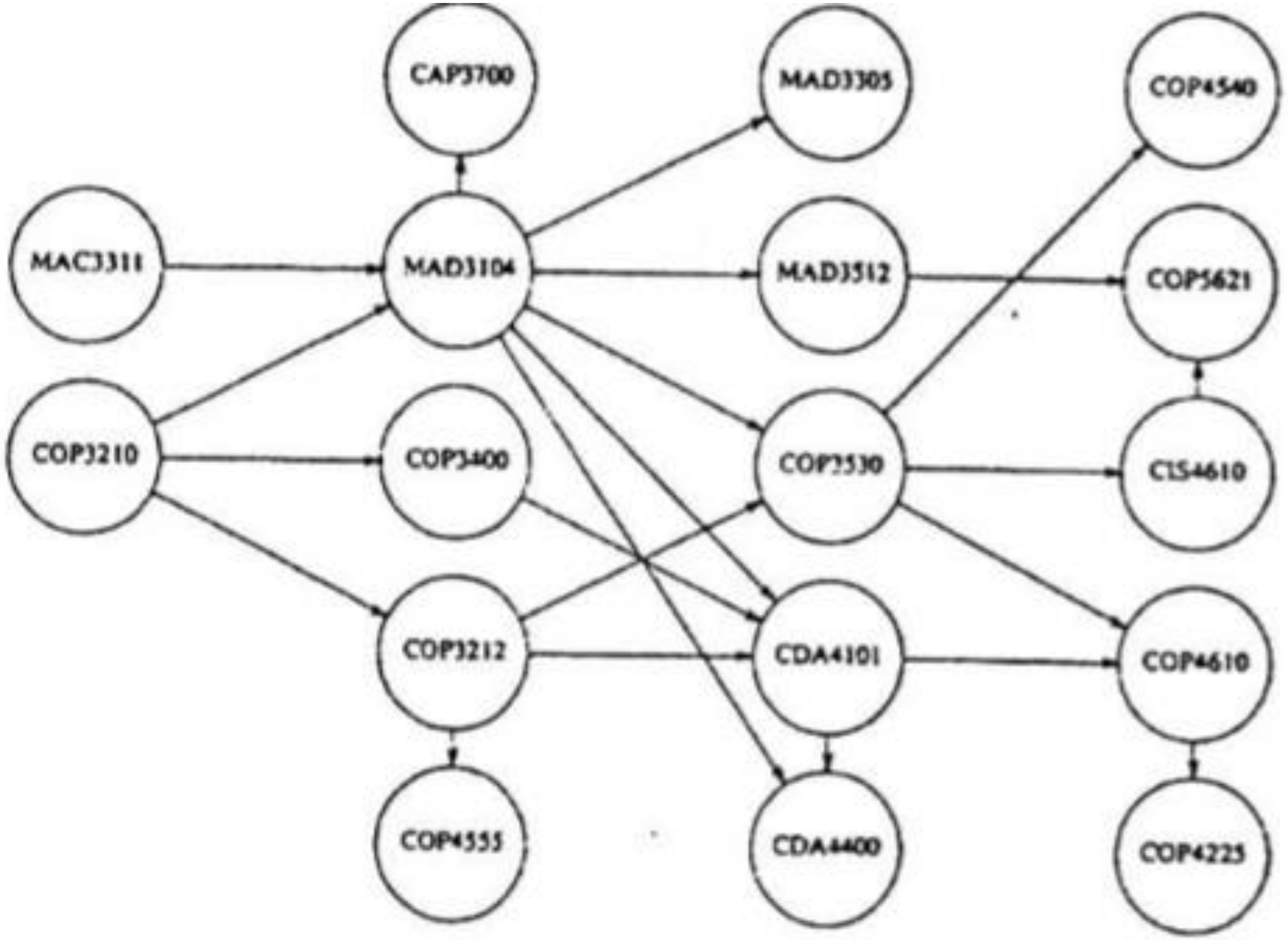
(* streets are two way. If 3000 intersections 4*n)

Adjacent list





Topological sort



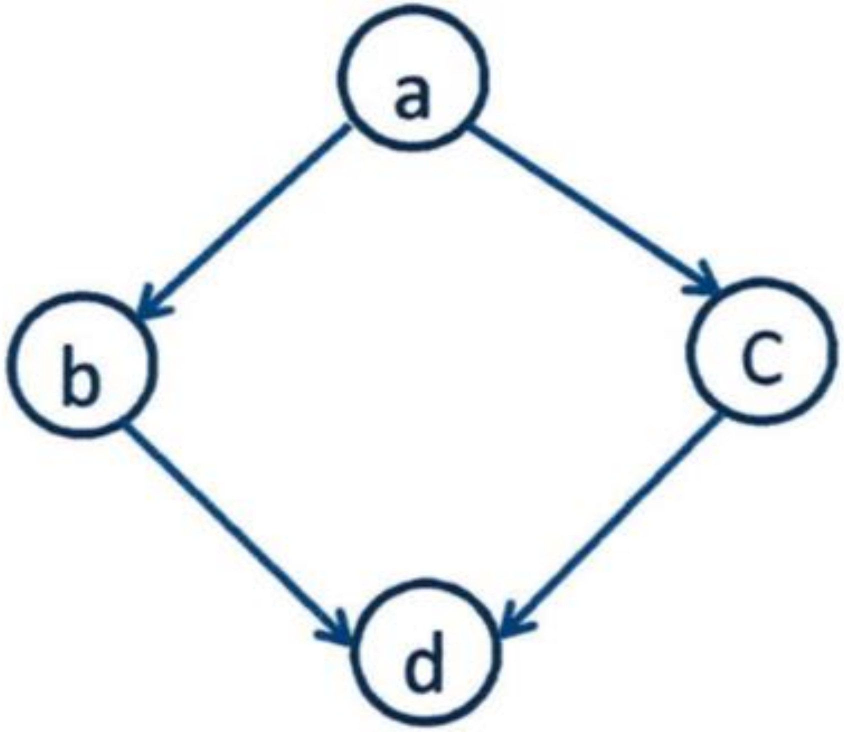
Directed

acyclic

graph

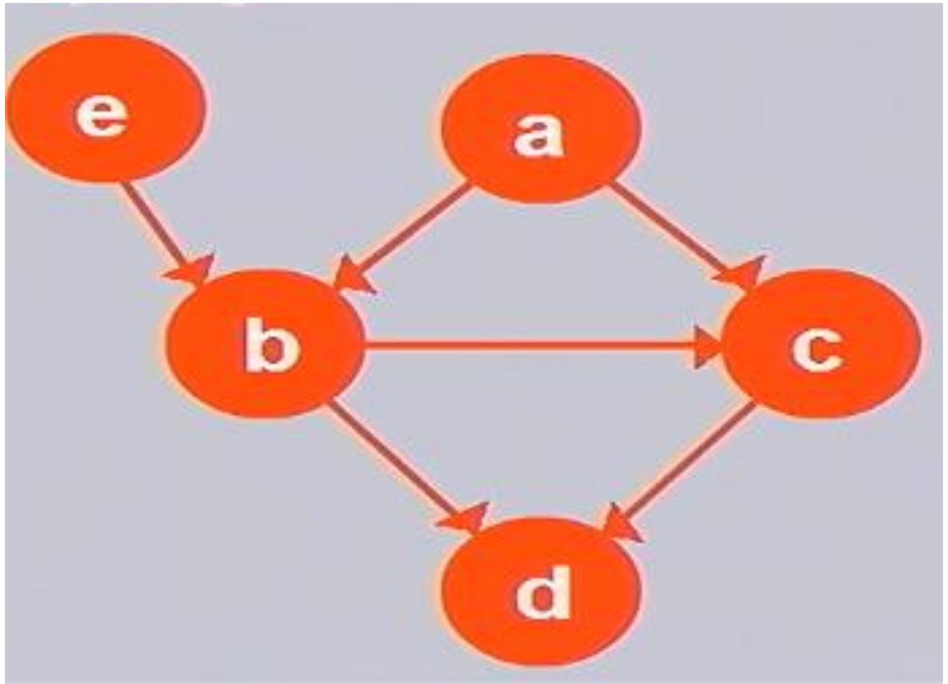
Topological sort

- Directed acyclic graph

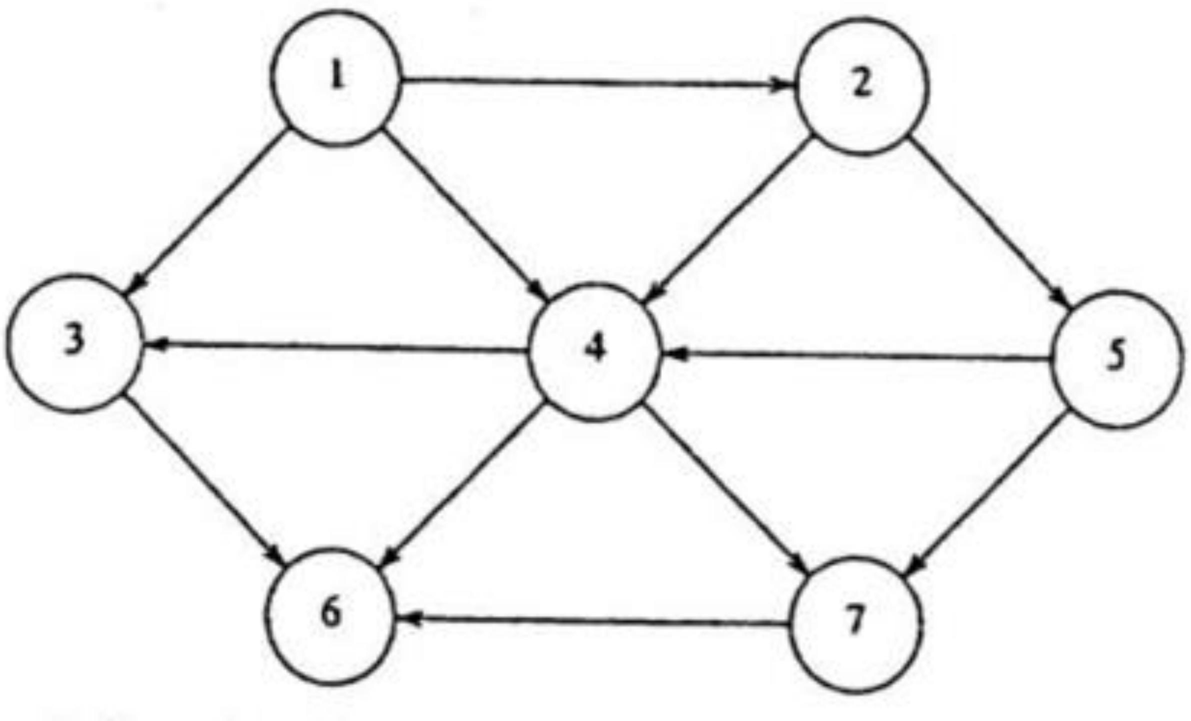


Topological sort

- Directed acyclic graph

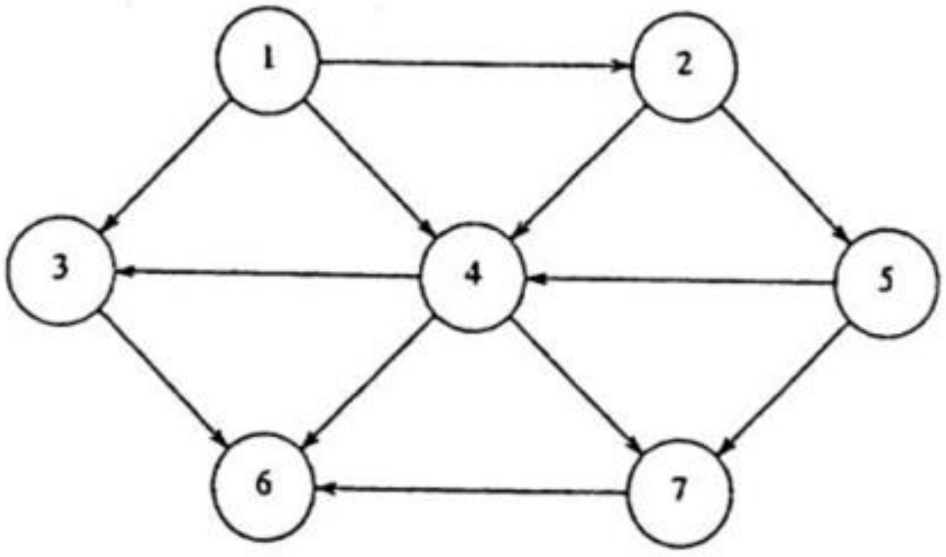


Topological sort



VERTEXT	INDREGREE
V1	
V2	
V3	
V4	
V5	
V6	
V7	
ENQ	
DEQ	

Topological sort



VERTEXT	INDREGREE	INDREGREE	INDREGREE
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V5			
V6			
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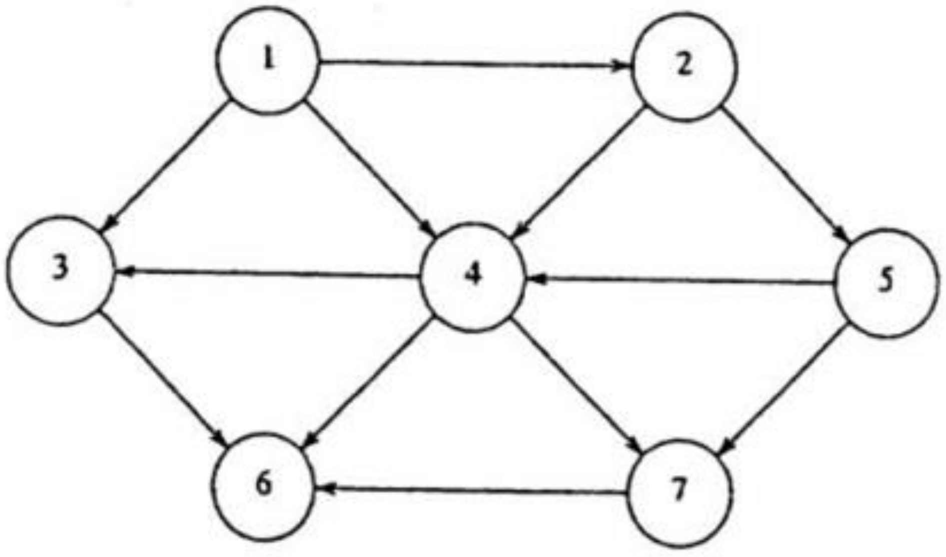
DEQ			

Topological sort



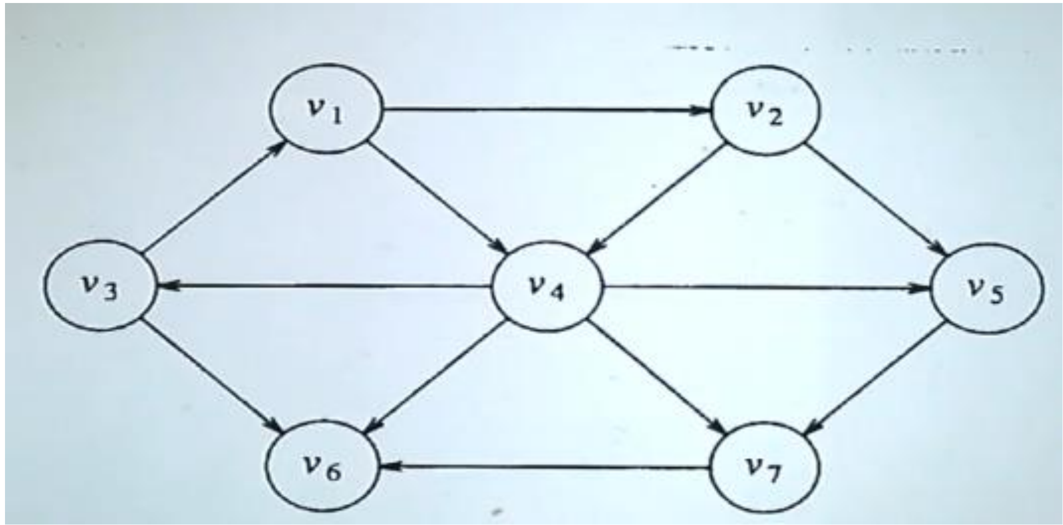
VERTEXT	INDREGREE	INDREGREE	INDREGREE
V1			
V2			
V3			
V4			
V5			
V6			
V7			
ENQ			
DEQ			

Shortest- Path algorithms

-The shortest path problem can be expressed as:

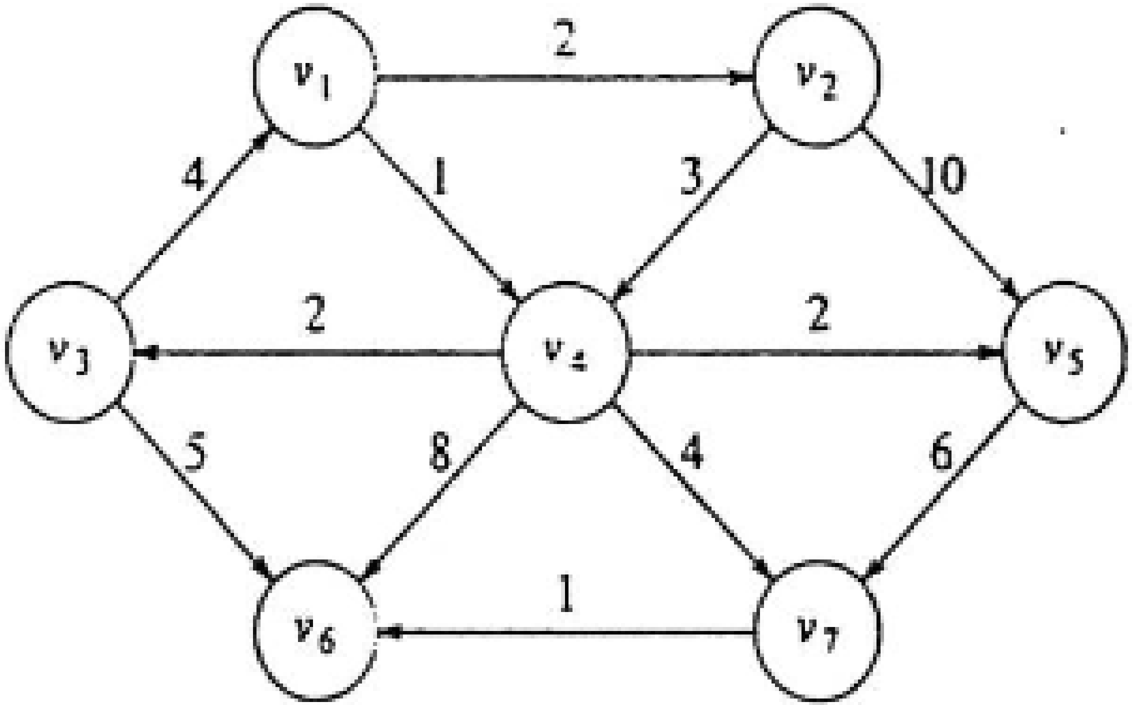
Given as input a weighted graph, G = (V,E), and a distinguished vertex,s find the shortest weighted path from s to from s to every other vertex in G

Shortest- Path : Unweighted



Vertex	Know	DV	PV
ENQ			
DEQ			

Shortest-Path:
Weighted(Dijkstra's ALG)



Vertex	Know	DV	PV
ENQ			
DEQ			