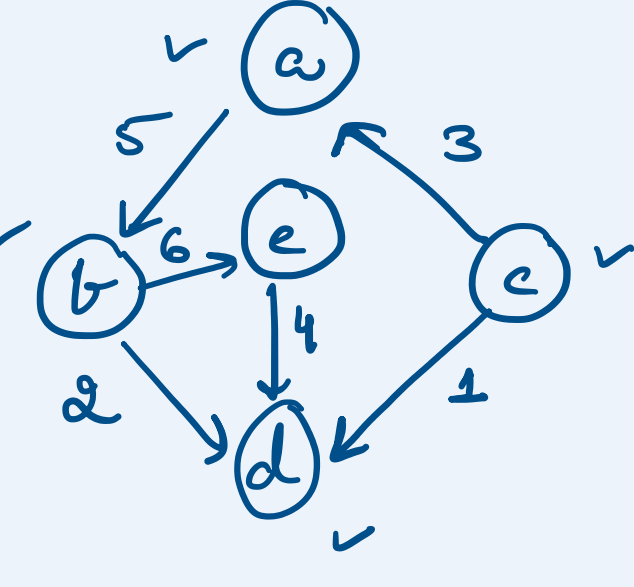


Graphs

directed / undirected
weighted

Hashmap \leftarrow string, vertices
node value \rightarrow neighbors



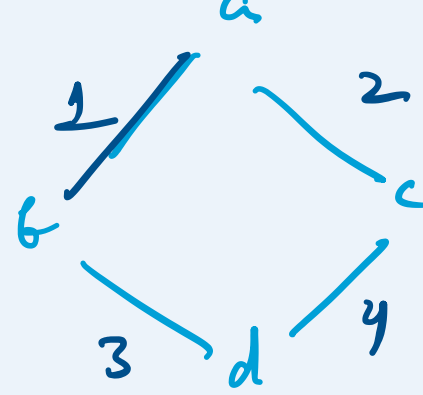
key	value
a	b 5
b	c 6 d 2
c	d 1
d	a 3
e	

Hashmap \leftarrow string, Integer
node value \rightarrow weight

a	
b	
c	
d	
e	

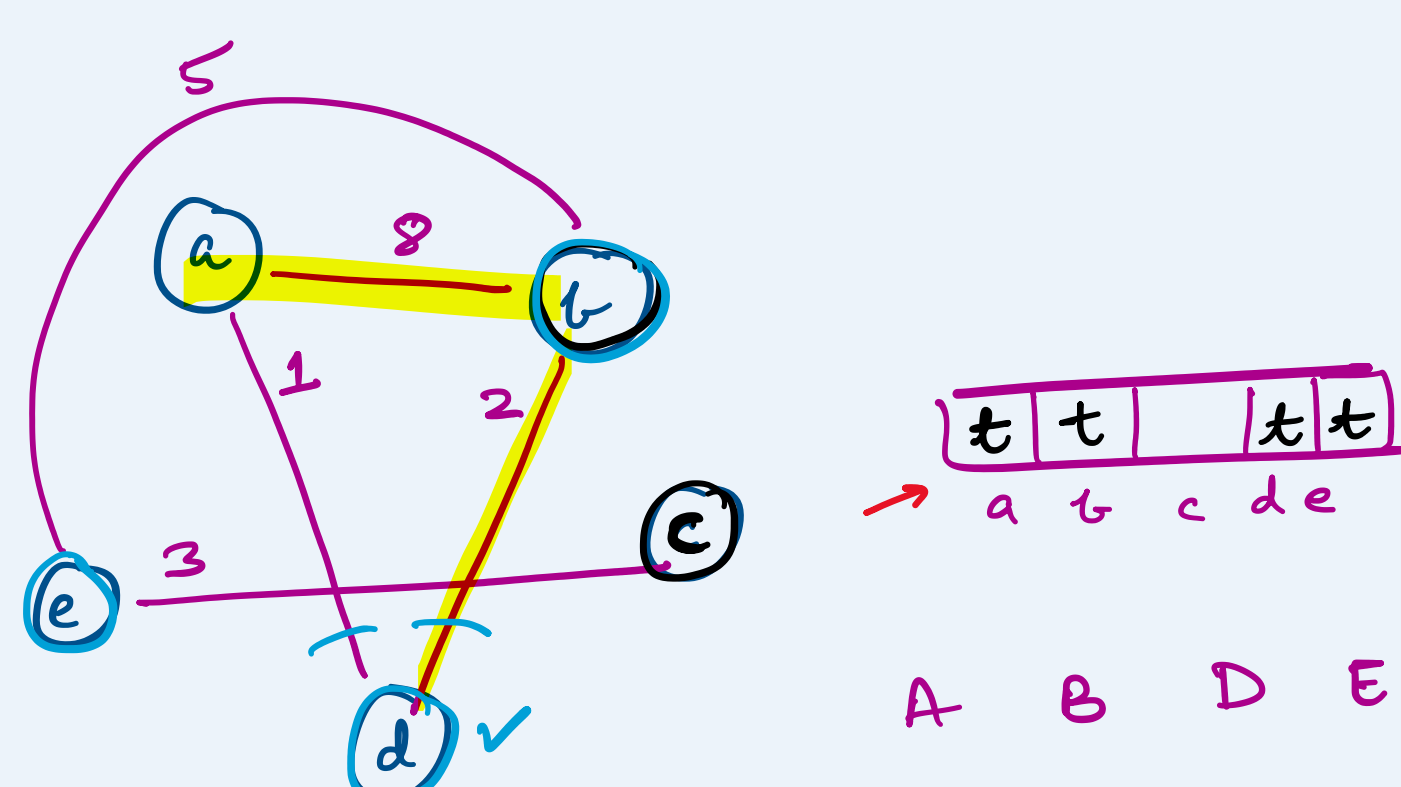
remove (b);

a	
b	
c	
d	
e	



remove Utx(d);

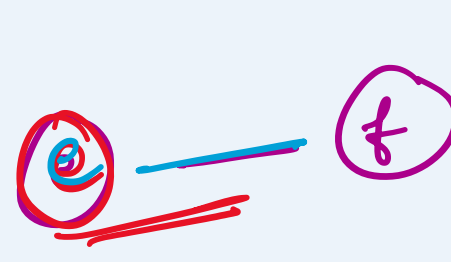
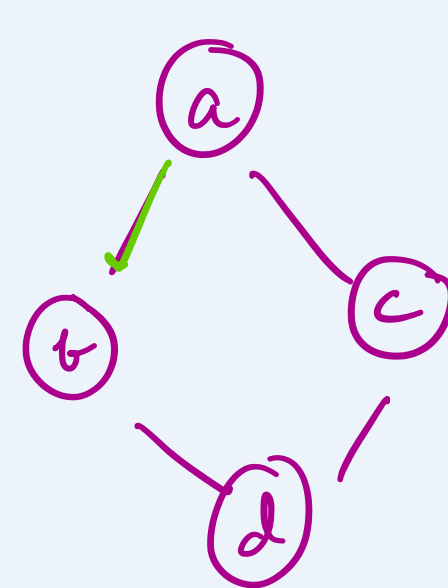
$\langle \text{b}, \text{c} \rangle$



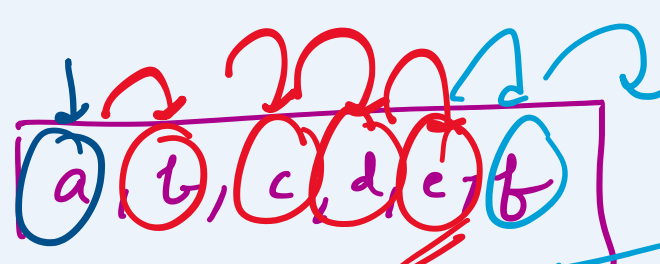
A B D E C

queue \leftarrow a | b | d | e | c

a | b | d | e | c



dfs



a	t
b	t
c	t
d	t
e	t
f	t

Graph \rightarrow Is Tree ()
boolean
[] \rightarrow ??

If a graph is a tree,

- 1) Graph should be connected
- 2) There should not be any cycle.

Q There are n rooms, and you start at room 0.

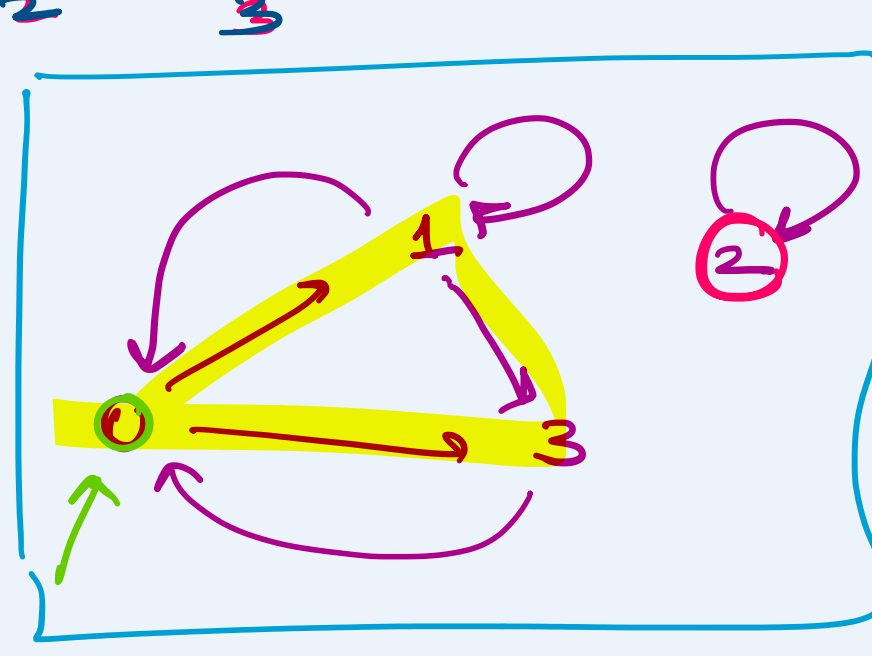
Each room 0 ... n-1.
some keys

Initially all rooms are locked except for 0.

Return true \rightarrow every room
false \rightarrow x

Eg ① $\left[\begin{bmatrix} 1 \end{bmatrix}, \begin{bmatrix} 2 \end{bmatrix}, \begin{bmatrix} 3 \end{bmatrix}, \begin{bmatrix} \end{bmatrix} \right]$
output \rightarrow true

② $\left[\begin{bmatrix} 1, 3 \end{bmatrix}, \begin{bmatrix} 3, 0, 1 \end{bmatrix}, \begin{bmatrix} 2 \end{bmatrix}, \begin{bmatrix} 0 \end{bmatrix} \right]$
output \rightarrow false

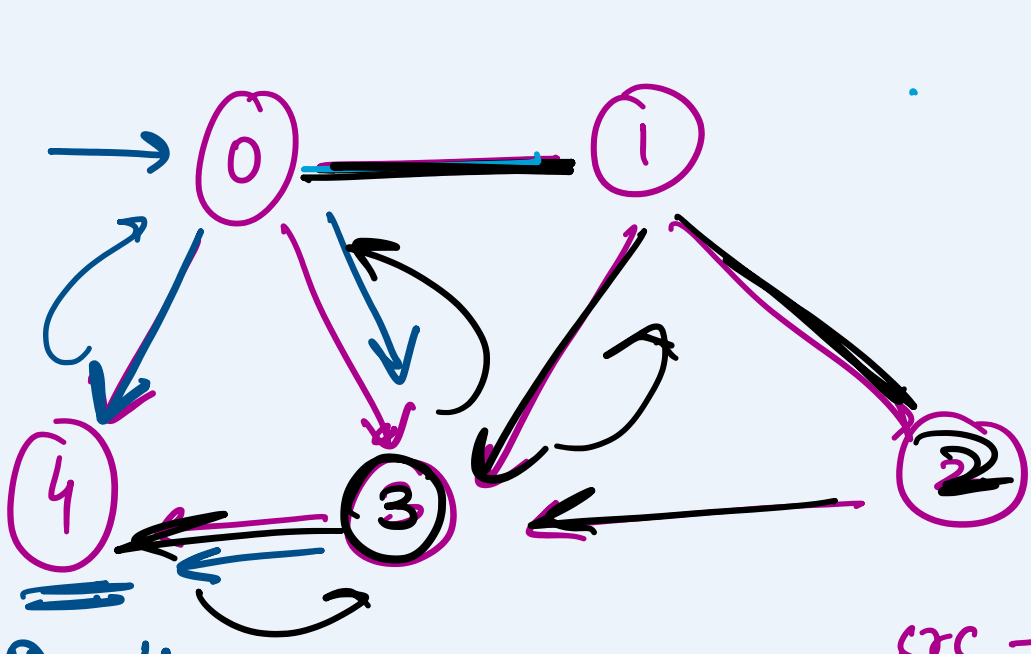
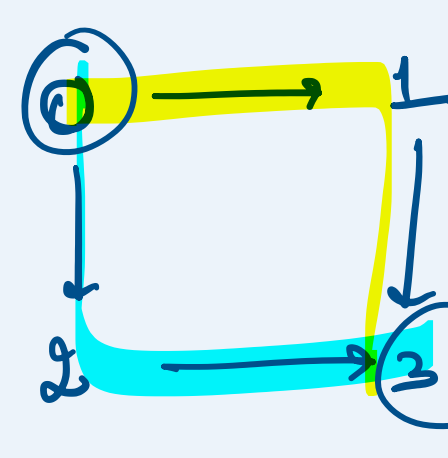


Q Given a directed acyclic graph, of n nodes 0 \rightarrow n-1.

find all possible paths from node 0 src to node n-1 dest

graph = $\left[\begin{bmatrix} 1, 2 \end{bmatrix}, \begin{bmatrix} 3 \end{bmatrix}, \begin{bmatrix} 3 \end{bmatrix}, \begin{bmatrix} \end{bmatrix} \right]$

output $\left[\begin{bmatrix} 0, 1, 3 \end{bmatrix}, \begin{bmatrix} 0, 2, 3 \end{bmatrix} \right]$



path \leftarrow $\langle 0, 4 \rangle$
 $\langle 0, 3, 4 \rangle$
 $\langle 0, 1, 3, 4 \rangle$
 $\langle 0, 2, 3, 4 \rangle$
 $\langle 0, 1, 2, 3, 4 \rangle$
 $\langle 0, 1, 3, 4 \rangle$