GATE

CRASH COURSE

DS & AI

Algorithms

Graph Traversals
(Part 01) (Lecture 10)

By - Aditya sir

Topics to be Covered

1.

2. Graph Traversals

3.

4.

About Aditya Jain sir

1. Appeared for GATE during BTech and secured AIR 60 in GATE in very first attempt - City topper
2. Represented college as the first Google DSC Ambassador.
3. The only student from the batch to secure an internship at Amazon. (9+ CGPA)
4. Had offer from IIT Bombay and IISc Bangalore to join the Masters program
5. Joined IIT Bombay for my 2 year Masters program, specialization in Data Science
6. Published multiple research papers in well known conferences along with the team
7. Received the prestigious excellence in Research award from IIT Bombay for my Masters thesis
8. Completed my Masters with an overall GPA of 9.36/10
9. Joined Dream11 as a Data Scientist
10. Have mentored working professions in field of Data Science and Analytics
11. Have been mentoring GATE aspirants to secure a great rank in limited time
12. Have got around 27.5K followers on Linkedin where I share my insights and guide students and professionals.

Telegram Link for Aditya Jain sir:

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Graph Traversals

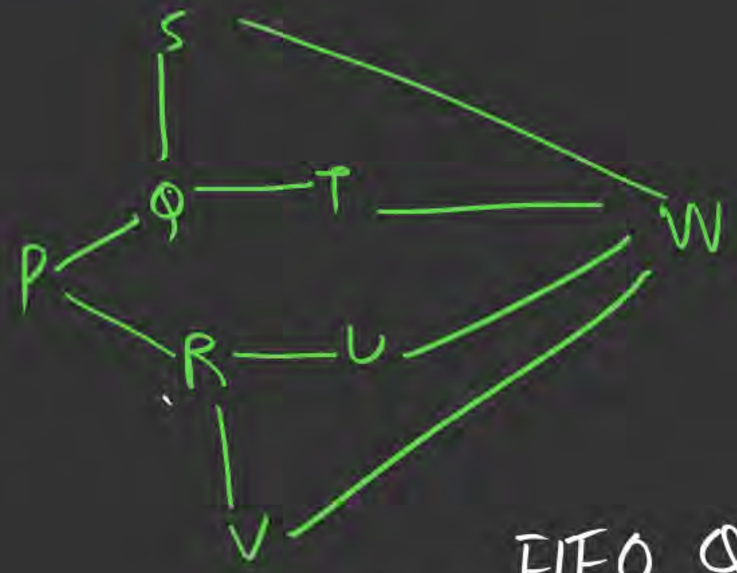
1) BFS (Breadth First Search/Traversal)
2) DFS (Depth First Search/ Traversal)

BFS → Queue → FIFO

DFS → Stack → LIFO

1) BFS / BFT

eg:-



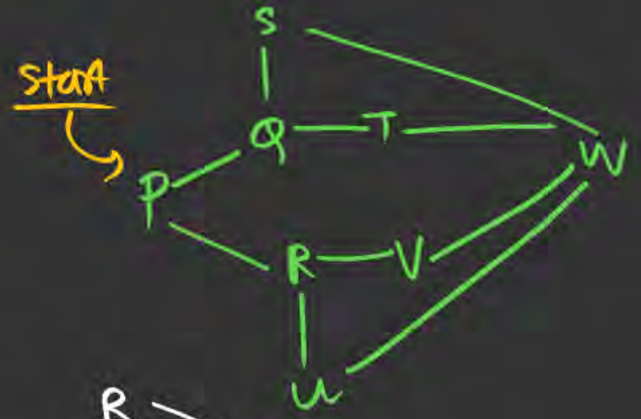
BFS starting at (P) (BFS Spanning Tree)

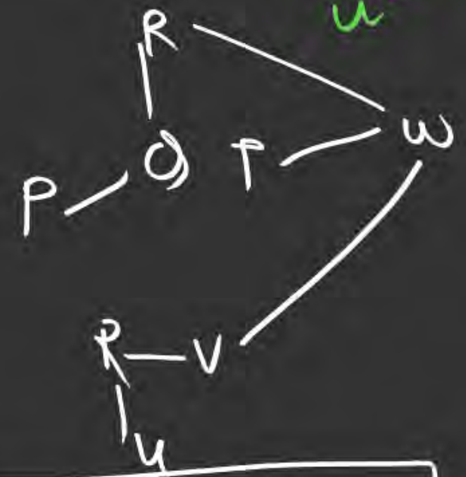
FIFO Queue

Node	~~P~~	~~Q~~	R	~~S~~	T	~~V~~	~~U~~	~~W~~
Parent	P	P	Q	Q	R	R	S	

o/p: PQRSTVUW

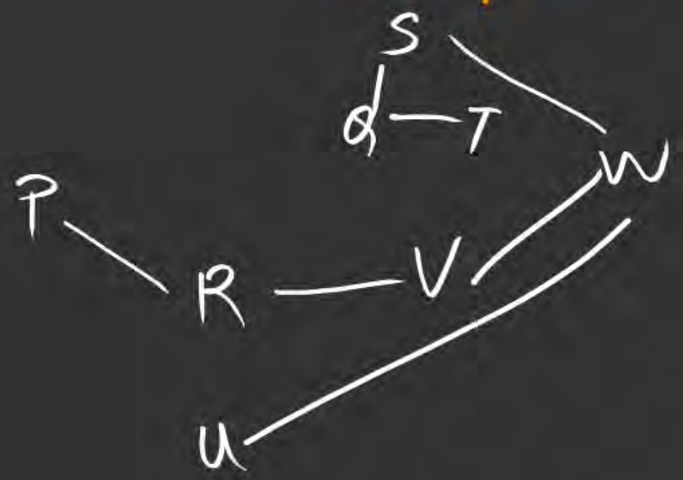
2) DFS (Depth First Search/Traversal)



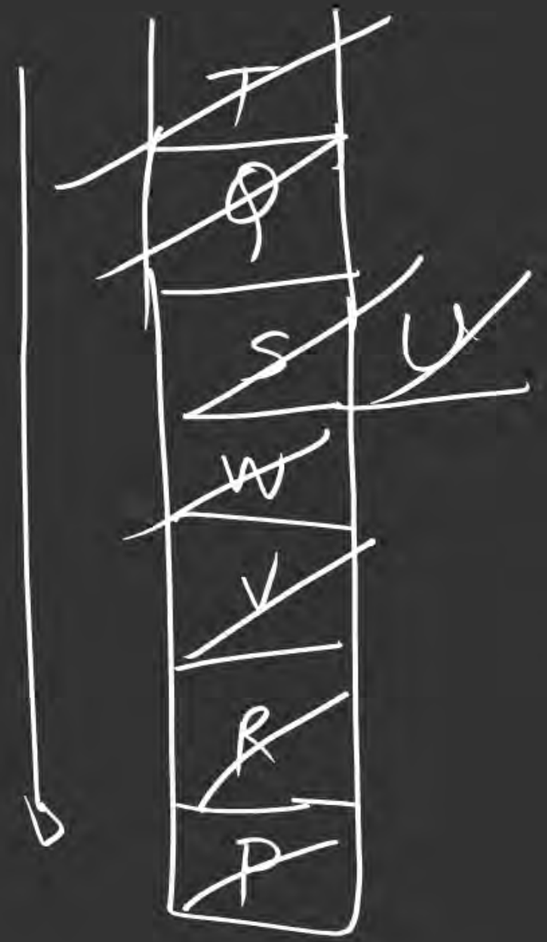


PQRWVRUT

DFS Spanning Tree starting at P.



O/P: PRVWSQTU

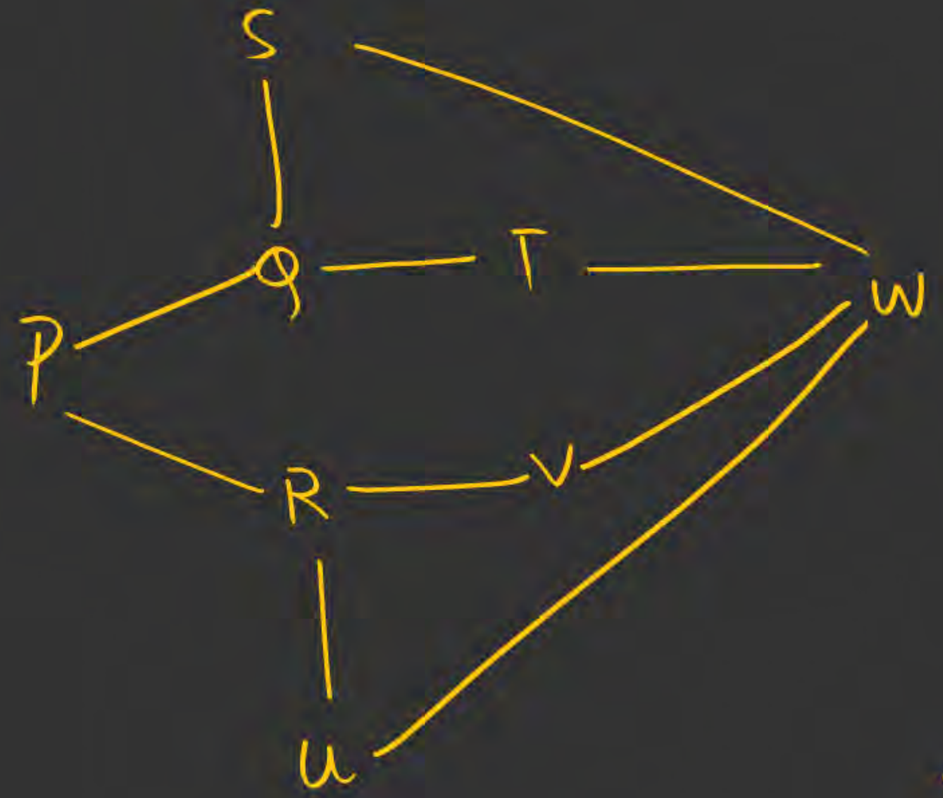


Timing → DFS

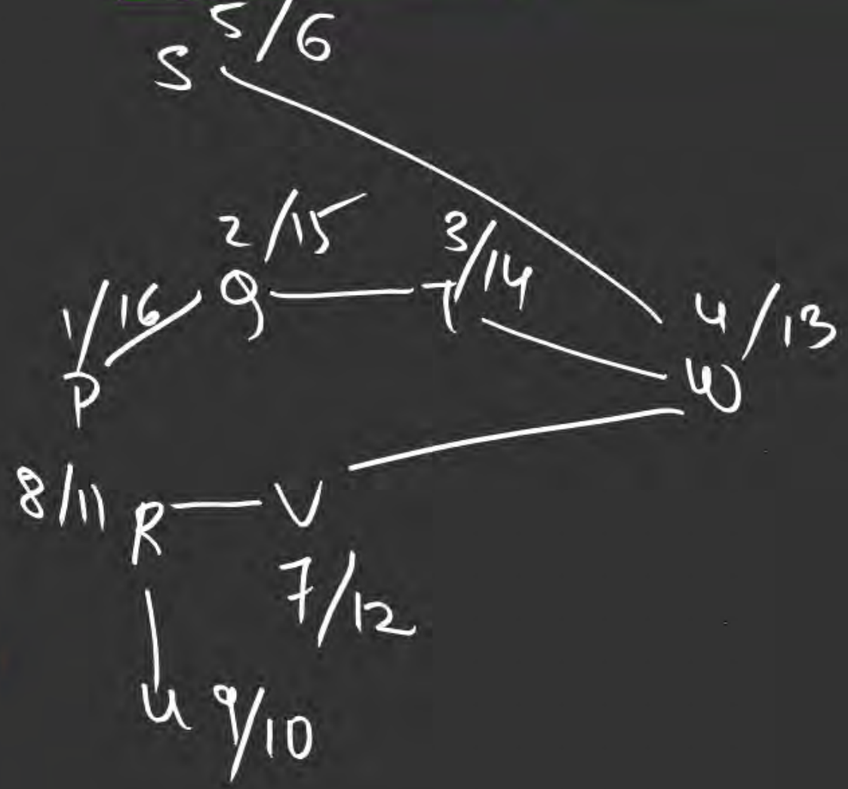
1) Discovery time (d)

2) Finishing time (f)

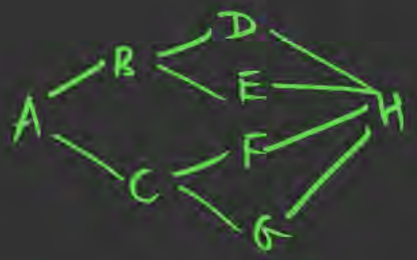
eg)



DFS Spanning Tree Starting at P



msq given a graph, which are valid DFS/BFS



A) ABFEDHGC ✗

B) ABEHDFCG ✓

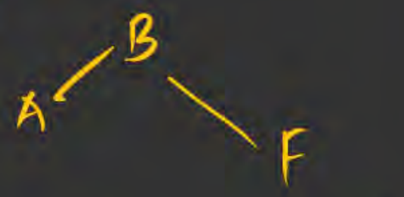
C) DHGCFABE ✓

D) HEBDACGF ✓

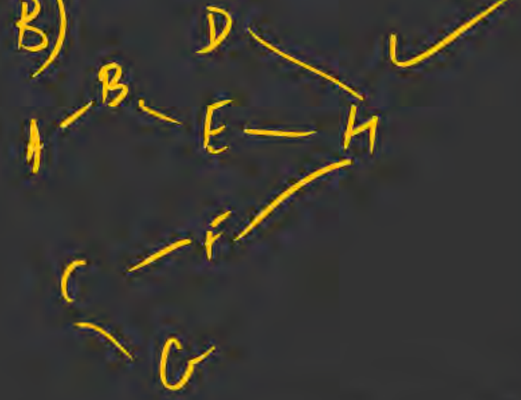
E) HDBEFCGA ✓

DFS

A) ✗

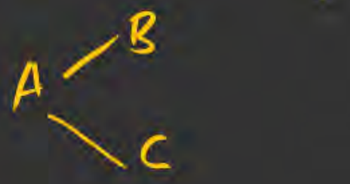


B) ✓



BFS

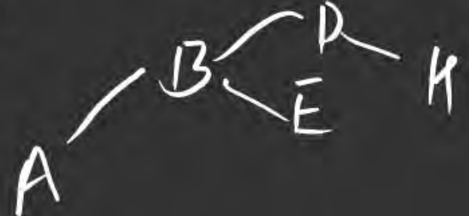
✗



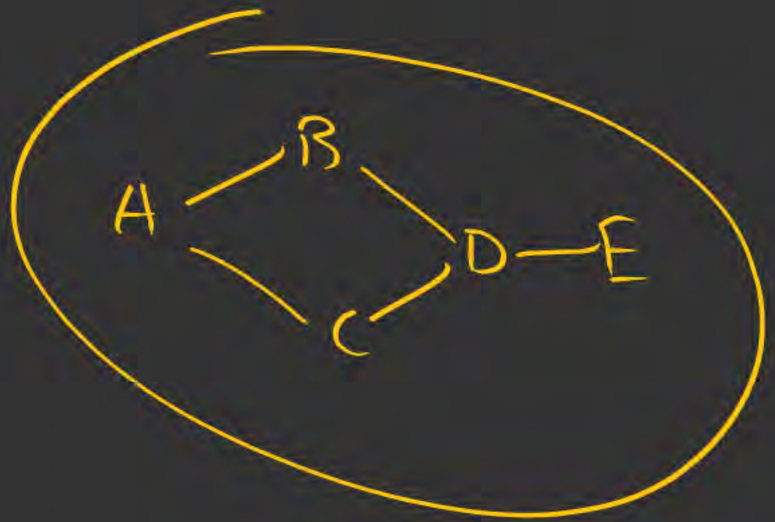
C)

D

E

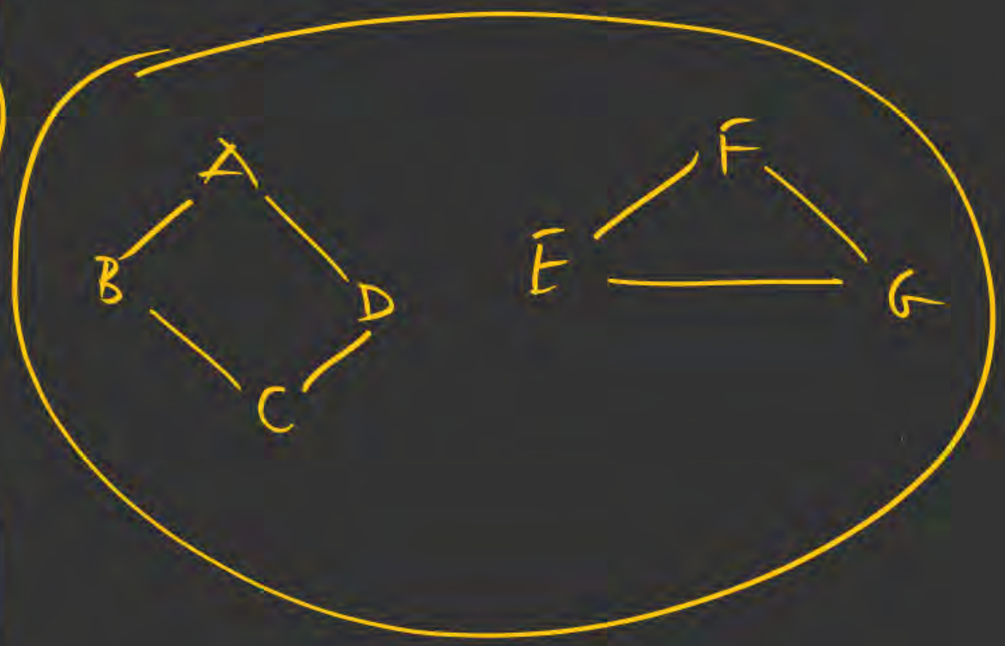


Connected

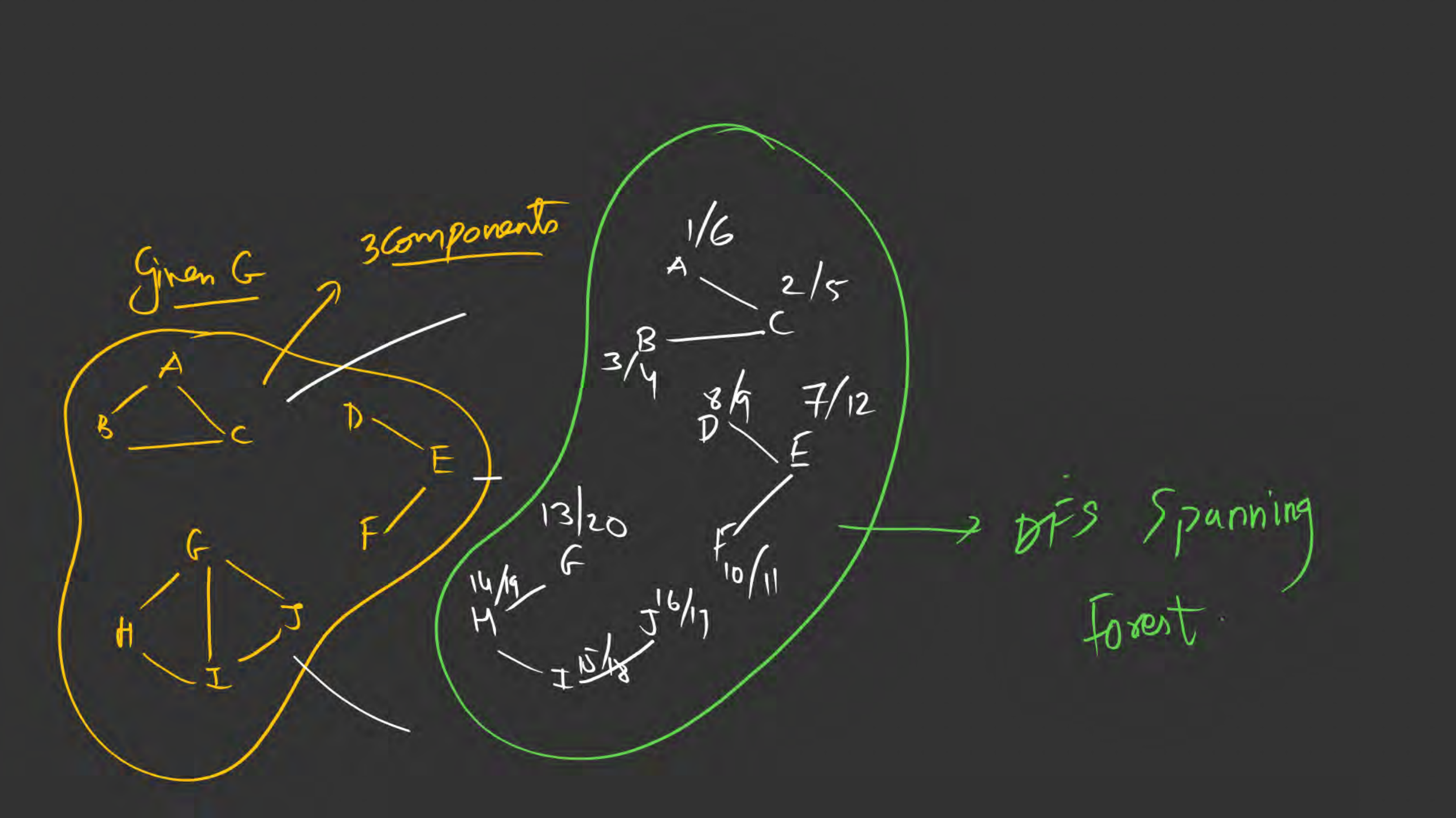


1

Dis-connected



2


Given G
3 Components
A
B
C
D
E
F
G
H
I
J
1/6
2/5
3/4
8/9
7/12
13/20
14/19
16/17
15/18
10/11
DFS Spanning Forest

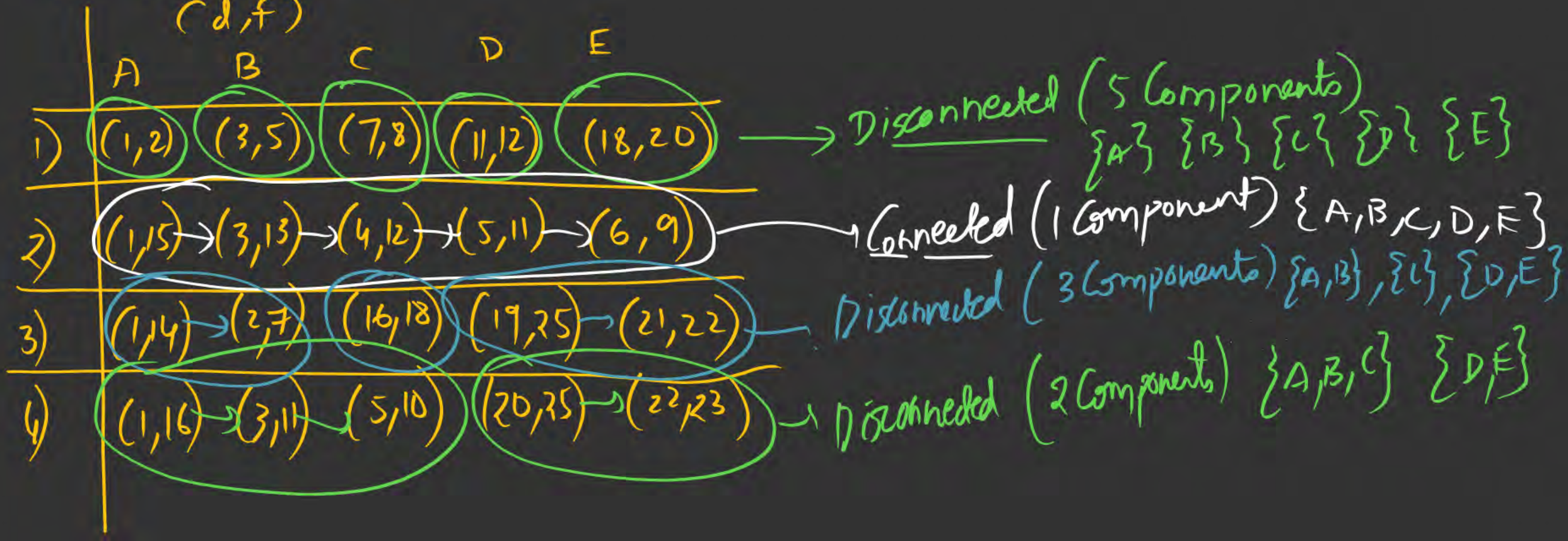
V.V. Imp : Given (G), n = 5

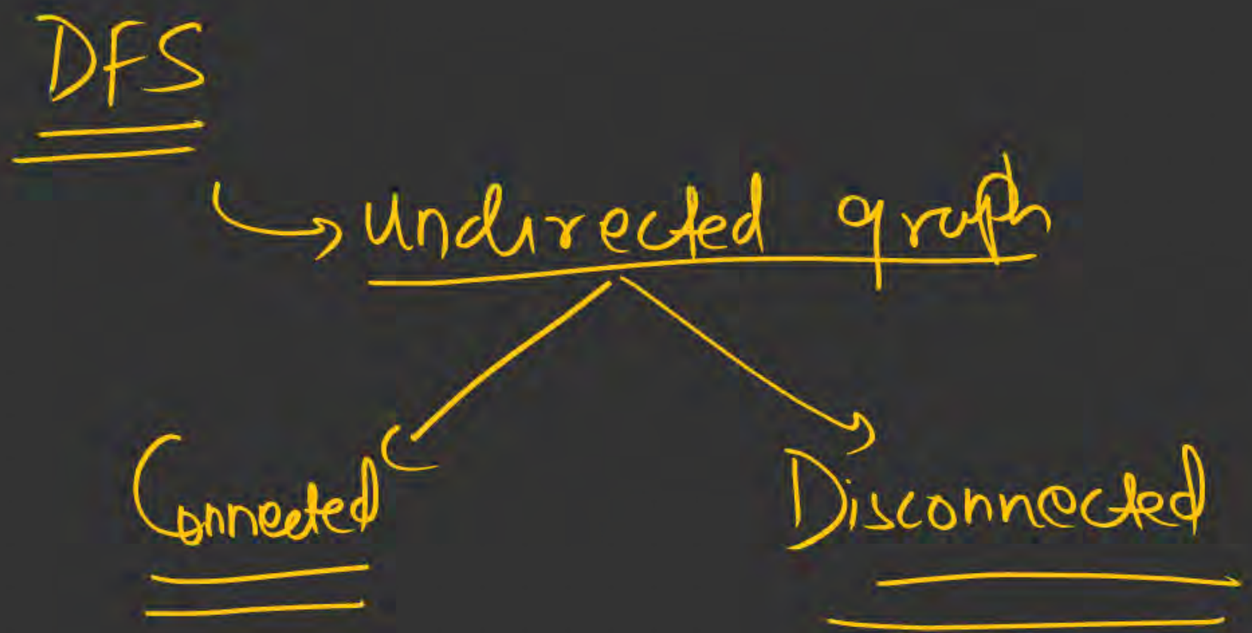
{A, B, C, D, E}

d/f → (d, f)

Q.1) How many connected components?

Q.2) What are those?




DFS
Undirected graph
Connected
Disconnected

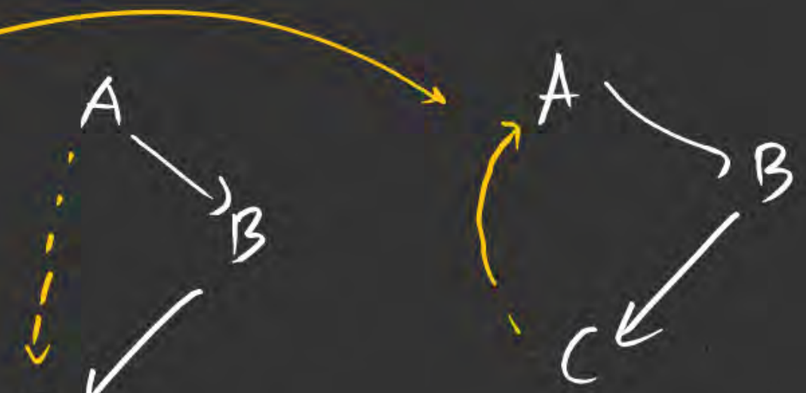
DFS → Directed graph

↳ Types of edges

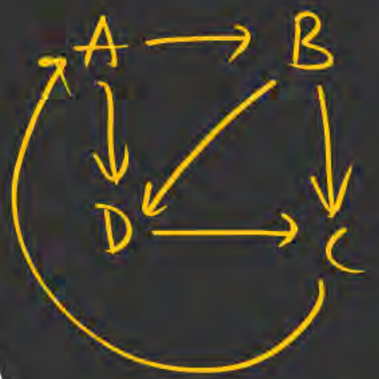
↳ DAG → Topological Sort } Properties

Types of edges :

1) Tree edge
2) Forward edge
3) Back/Backward edge
4) Cross edge

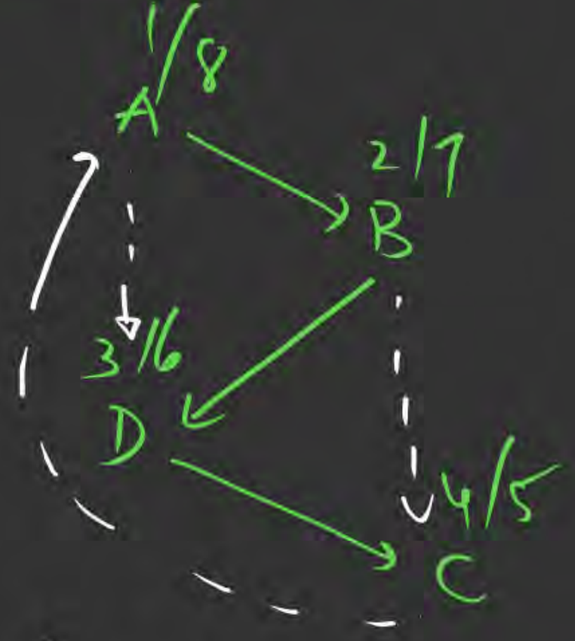


(9) Given G(V,E)



HW

DFS start at A



1) Tree edges

AB, BD, DC

2) Forward edges

AD, BC

3) Backward edges

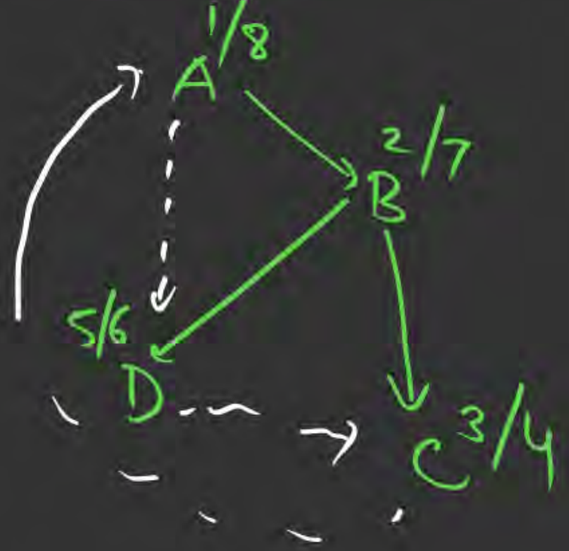
CA

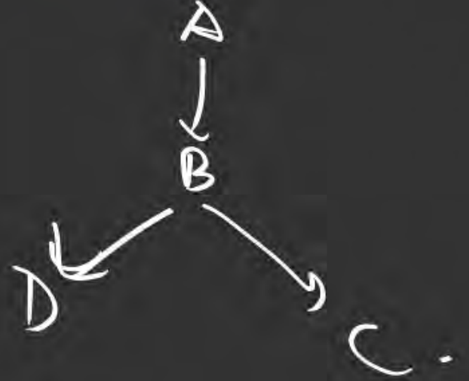
4) Cross edges

None

(9) Given G(V,E)

DFS start at A





1) Tree edges:

AB, BC, BD

2) Forward edges

AD

3) Backward edge

CA

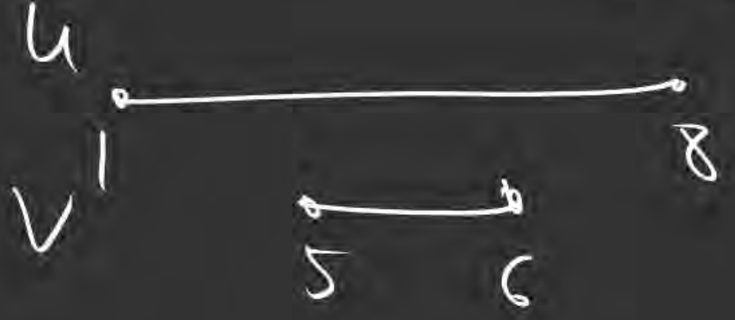
4) Cross edge

DC

1) AD

A : u 1/8

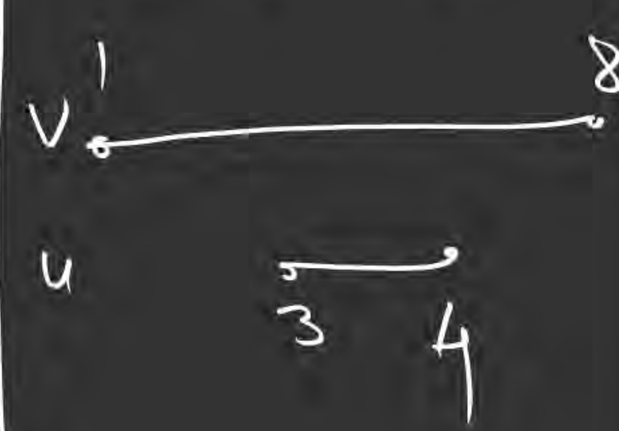
D : v 5/6



② CA

C : u 3/4

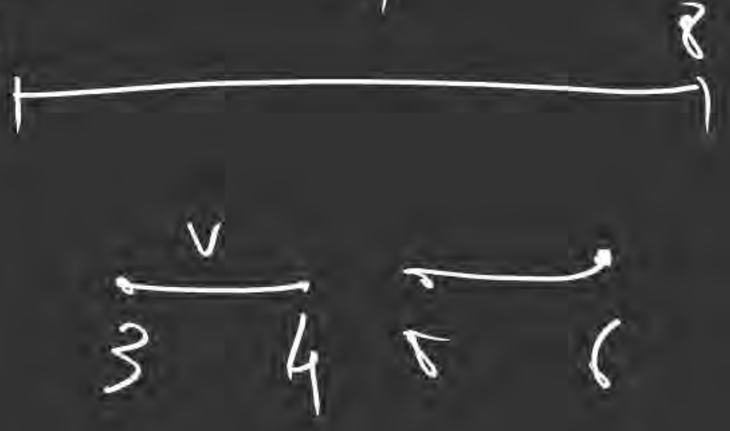
A : v 1/8



③ DC

D : u : 5/6

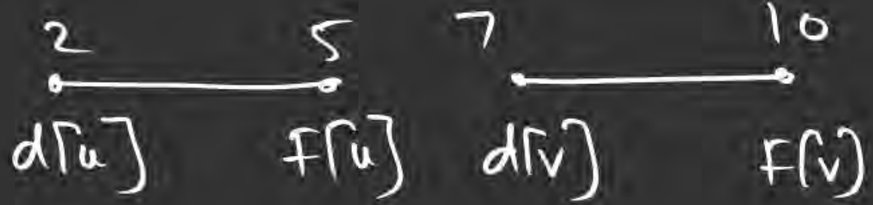
C : v : 3/4



Properties $u \rightarrow v$

$(d[u], f[u])$ $(d[v], f[v])$

1) Disjoint:

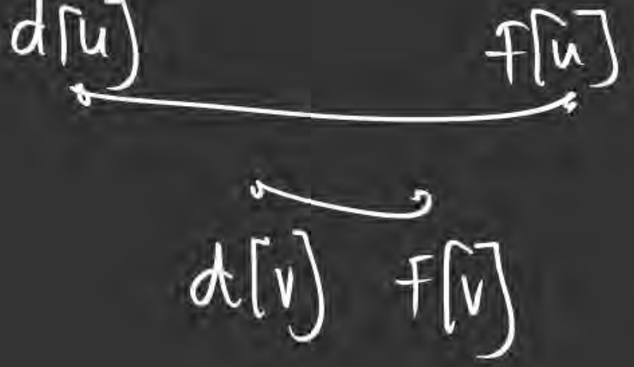


$u \rightarrow v$: Cross edge

2)

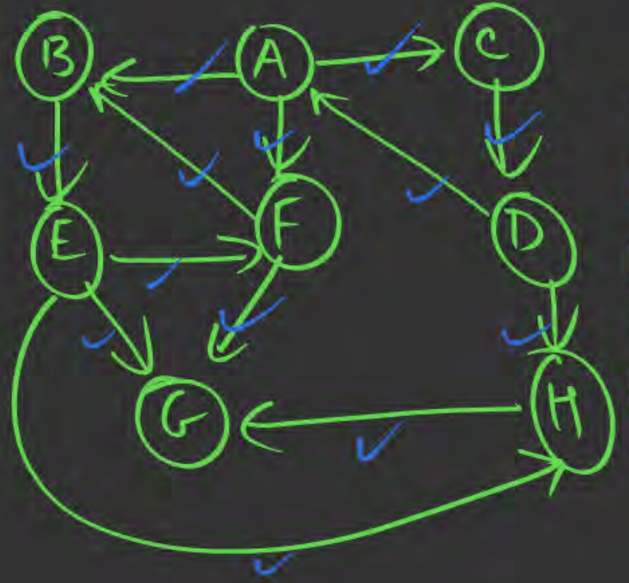
$u \rightarrow v$: Back edge

3)



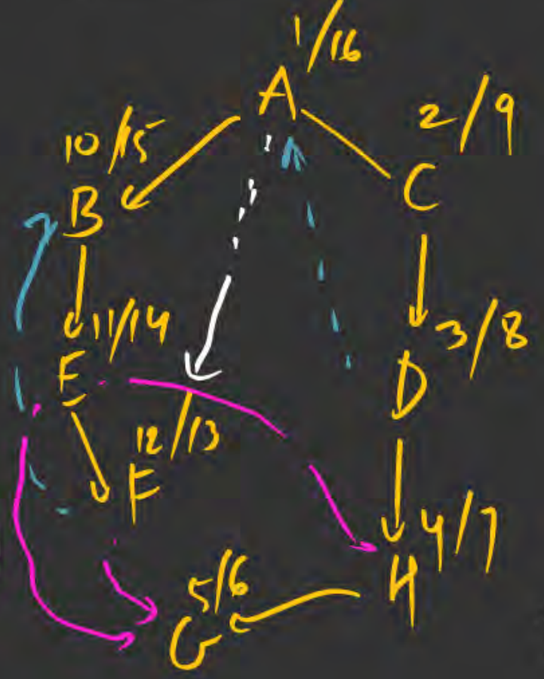
$u \rightarrow v$ Forward edge

End-to-end Revision



13 edges

DFS at A



1) Tree edges

AC, CD, DH, HG, AB, BE, EF → (7)

2) Forward edges

AF → (1)

3) Backward edges

DA, FB → (2)

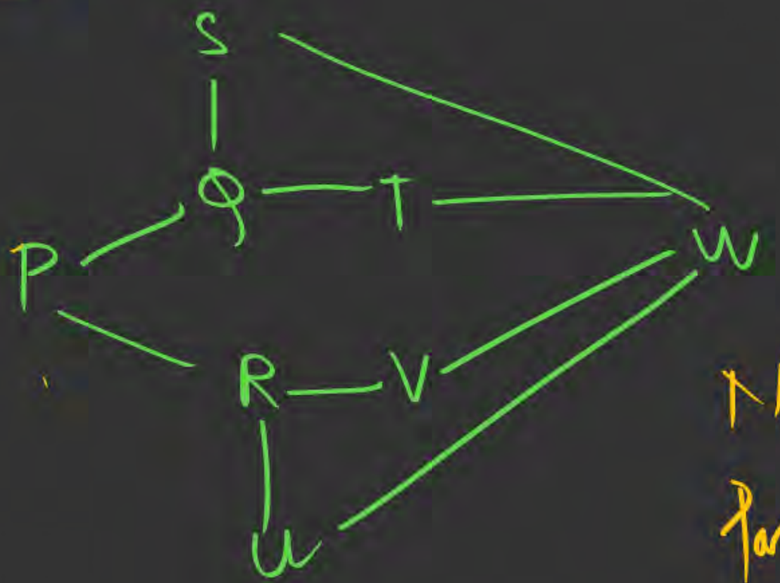
4) Cross edges:

FG, EH, EG → (3)

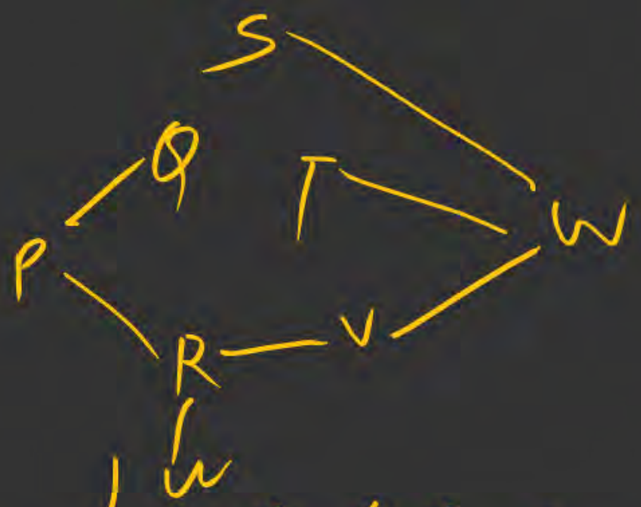
BFS → Default (FIFO)

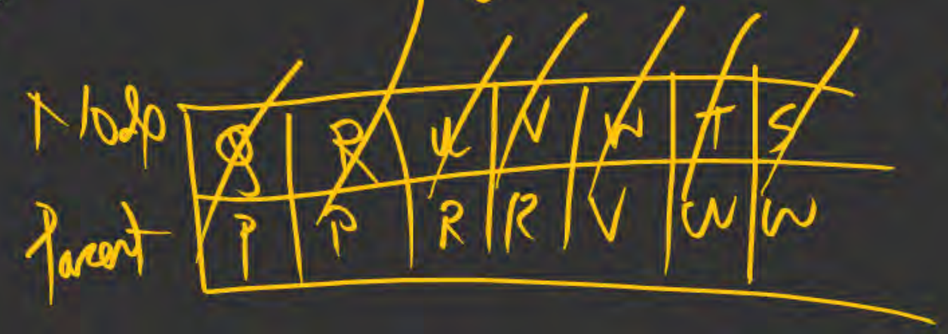
Bonus

BFS
LIFO Queue



BFS at P

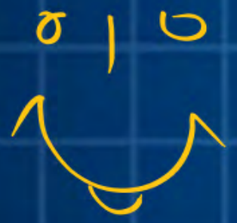




O/p: PRVWSTUQ

HW

Diff from DFS



Thank

THANK

Keep Hustling!