CS & IT ENGINEERING

Algorithm

Graph Algorithms and Miscellaneous

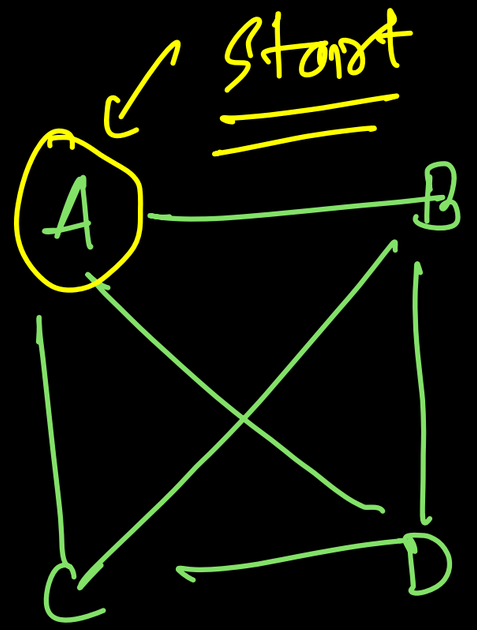
DPP 01 (Discussion Notes)

By- Aditya Sir

[NAT] **[1-Mark]**

#Q. Suppose, G is a undirected connected complete graph with 4 vertices. How many BFS traversals are possible for Graph G_____?

Ans :- 24



	B	C	D
A	3	2	1

A $3 \times 2 \times 1 \longrightarrow 6$

B $3 \times 2 \times 1 \longrightarrow 6$

C $3 \times 2 \times 1 \longrightarrow 6$

D $3 \times 2 \times 1 \longrightarrow 6$

$4 \times 6 = 24$

A BCD
A BDC
A CBD
A CDB
A DCB
A CBC

$\rightarrow 6$

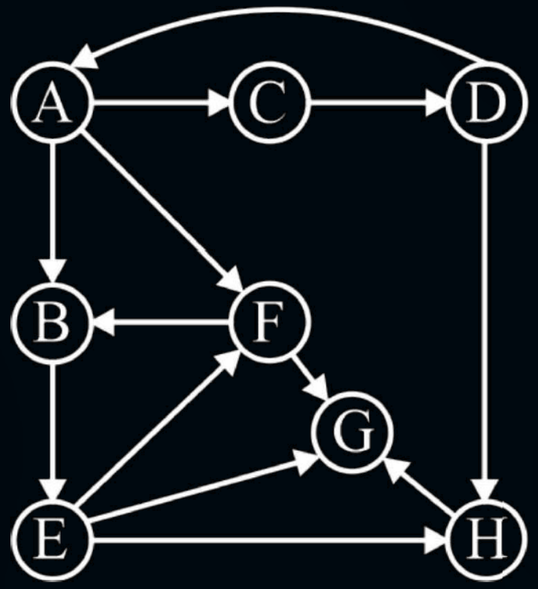
$6 \times 4 = \underline{\underline{24}}$

Shortcut

$4!$

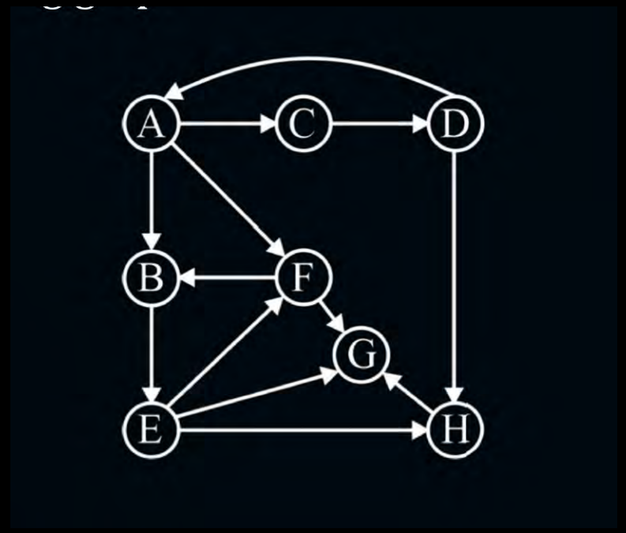
[NAT] [1-Mark]

#Q. Consider the following graph



Suppose after applying DFS traversal starting from node 'A'. How many tree edges exits_____?

Ans :- 7



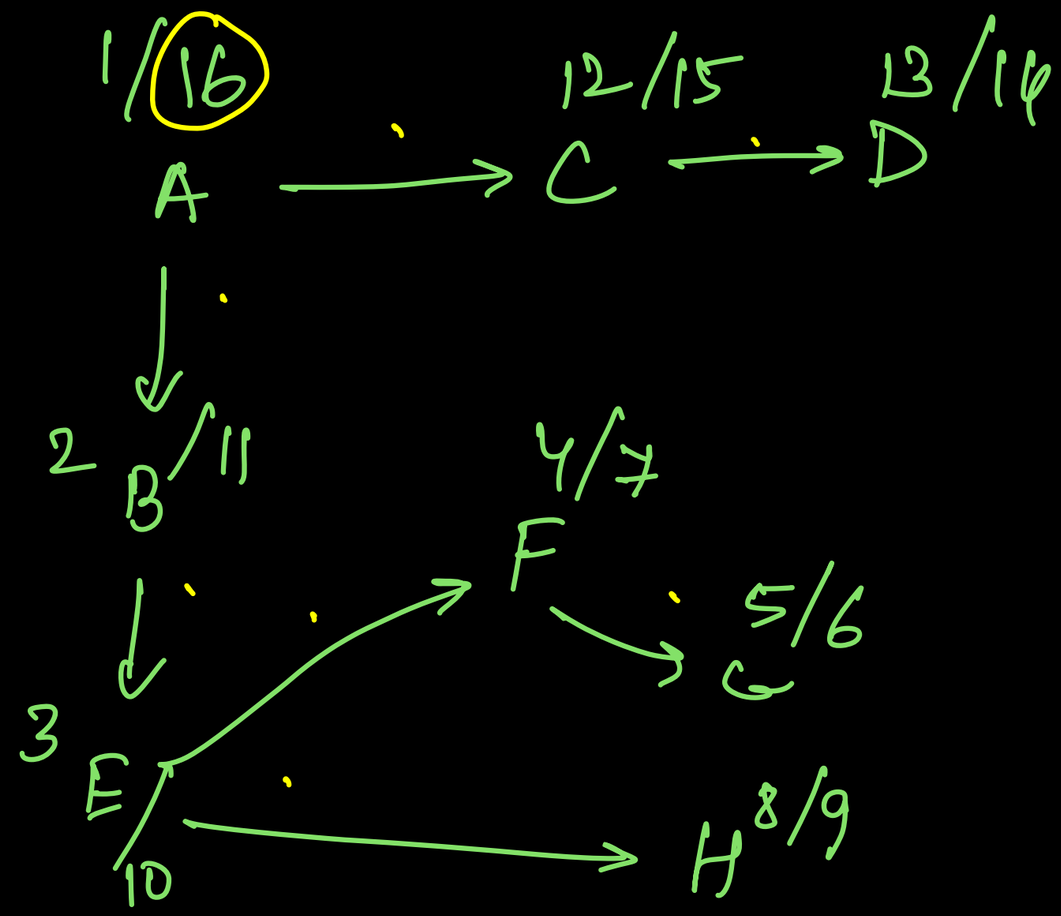
DFS at A

Tree

DFT

&

Graph



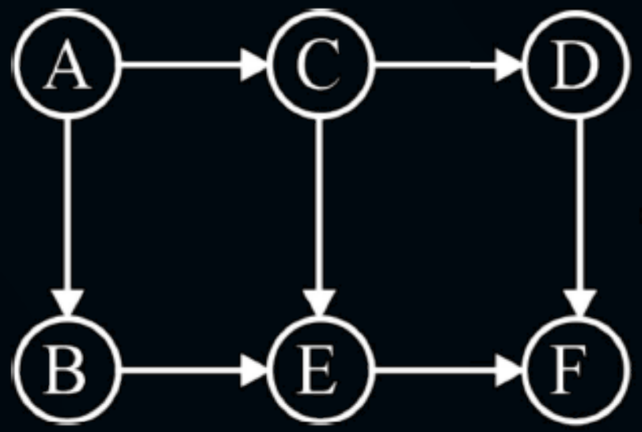
n = 8

2x8 = 16

[NAT] [1-Mark]

#Q. Consider a following graph

G:



How many topological orders are possible for graph G:

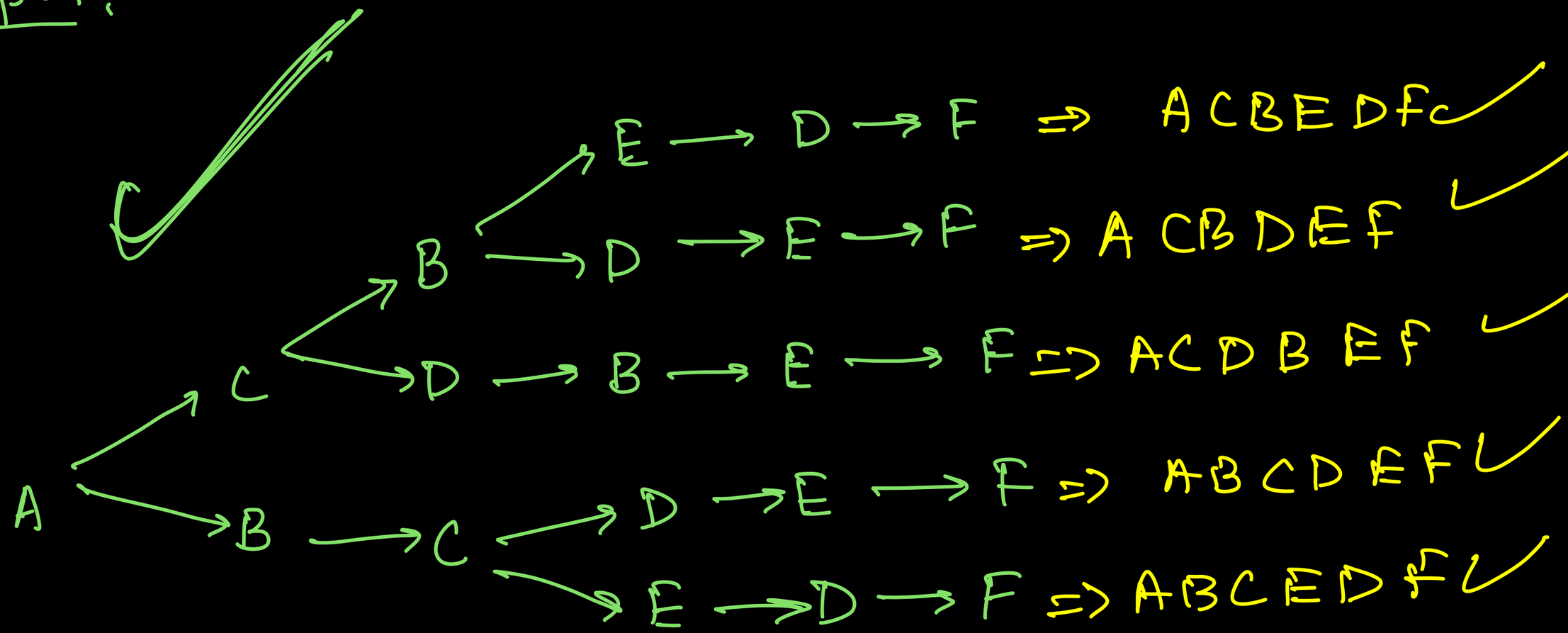
Source : A

Sink : F

Topo : A ——— F

Ans : 5

Approach :-



Shortcut:-

A _____ F

B C D E

B C E D

B D C E

[MCQ] [1-Mark]

#Q. Consider the statements

S1: Starting from vertex Vo in a graph, the time required by DFS to find a path (if exists) to some vertex V is always less than that is required by BFS.

S2: The space required by DFS is always less than that is required by BFS

Which of the following statement is true ?

wc: O(n)

A Only S1

Ans: D

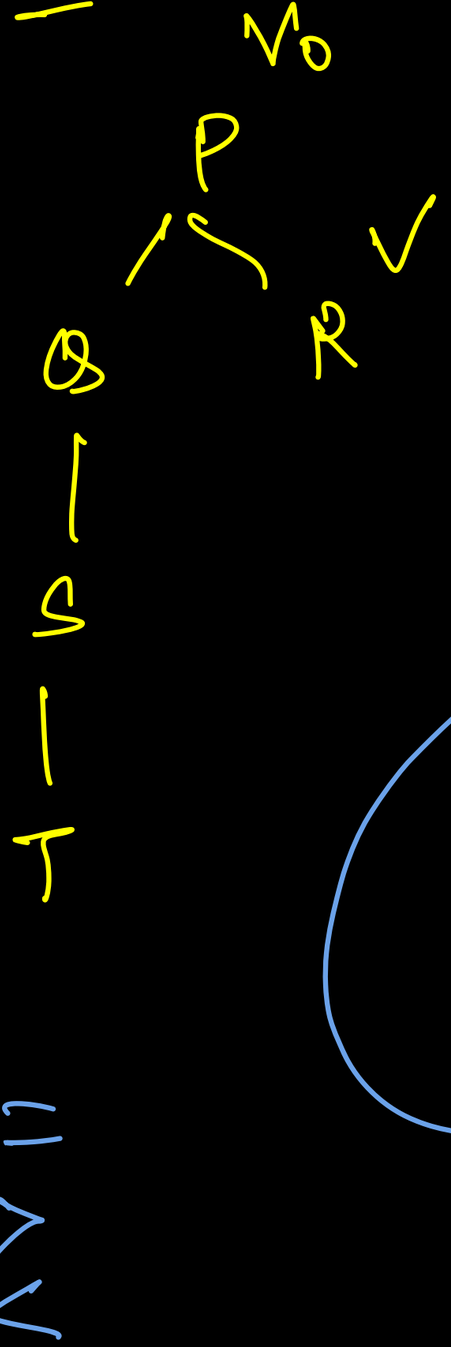
B Only S2

C Both S1 and S2

D Neither S1 Nor N2 is true

$V_0 \rightsquigarrow V$ (P ⇝ R)

Eg :-



① DFS :-

Case :- P R Q S T ⟶ 1 unit

② BFS

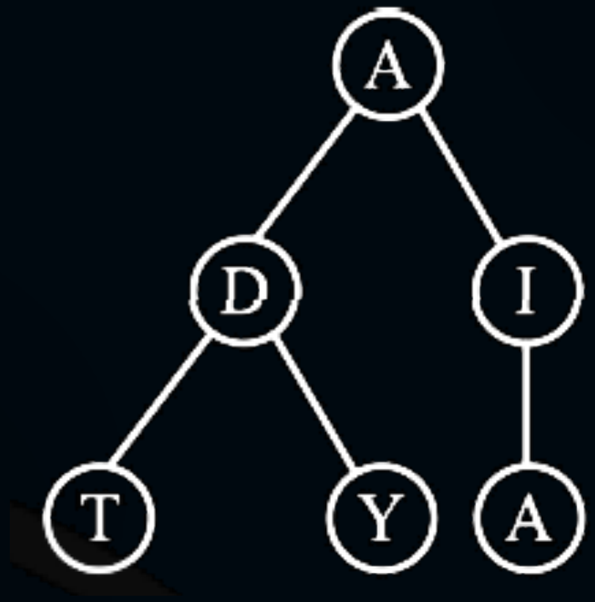
Case 2 :- P Q S T R ⟶ 4 unit

Case 1 :- 1) P R Q S T ⟶ 1 unit

Case 2 :- 1) P Q R S T ⟶ 2 unit

[MSQ] [1-Mark]

#Q. Consider the following graph



Which of the following is/are correct BFS traversal?

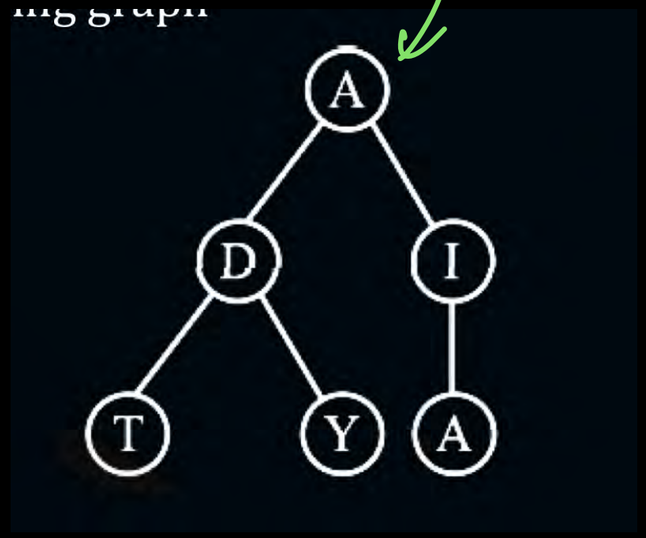
A, C, D

A ADITYA ✓

B AIADYT ✗

C YDATIA ✓

D DTYAIA ✓



A) ADITYA ✓

ADITYA

D	I	T	Y	A
A	A	D	D	I

B) AIADYT

I	D
A	A

AI

C) YDATIA

YDATIA

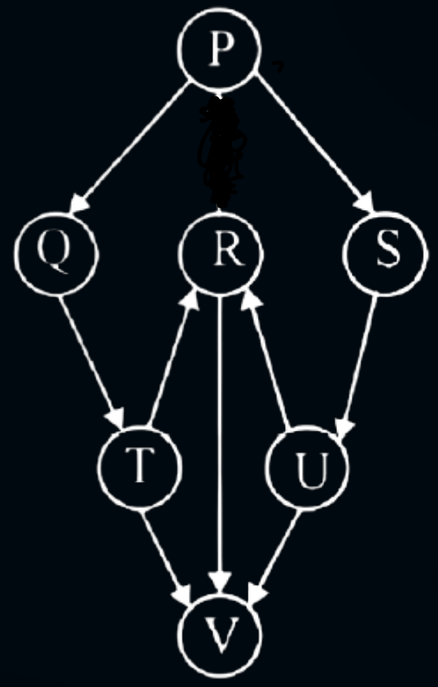
D	A	T	I	A
Y	D	D	A	I

D) DTYAIA

DTYAIA

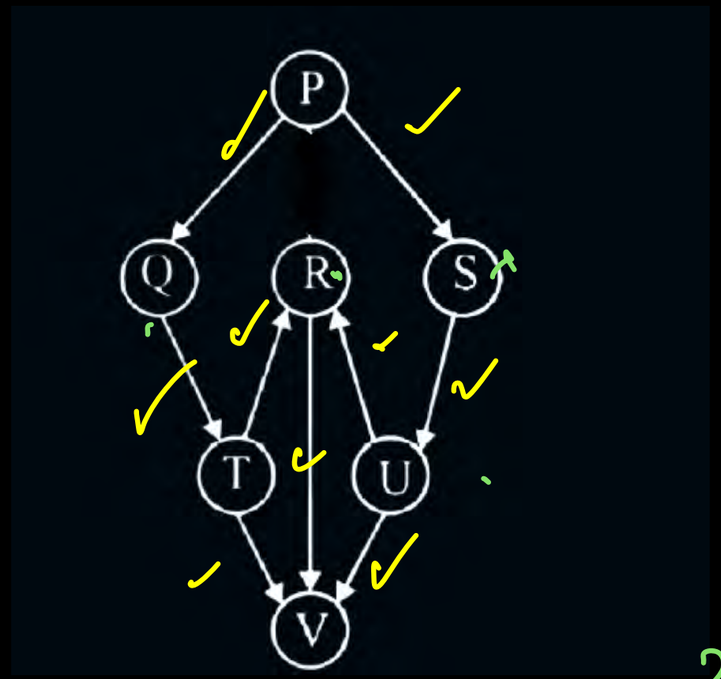
[NAT] [2-Marks]

#Q. Consider the following Graph G:



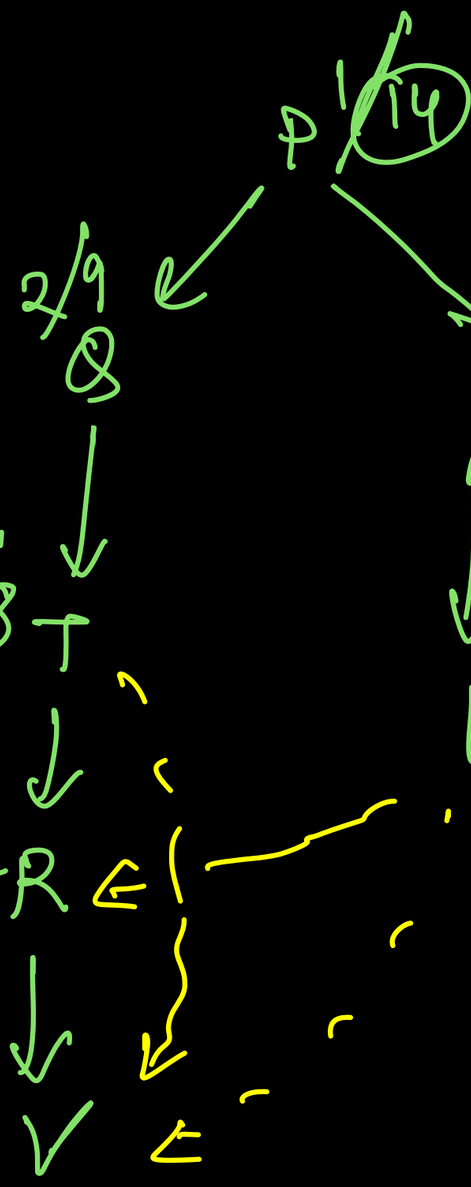
Ans :- 2

Apply DFS on G starting at vertex P and selection of adjacent vertex in DFS ~~divided~~ decided by the Lexicographical order in Graph G, Q and S are adjacent to P. First it selects Q because Q comes first in Lexicographical order. Then what is the number of cross edge when the DFS performed on G is_____.



n = 7

DFS starting at P



Types of edges:

1) Tree: (6).

2) Forward: TV (1).

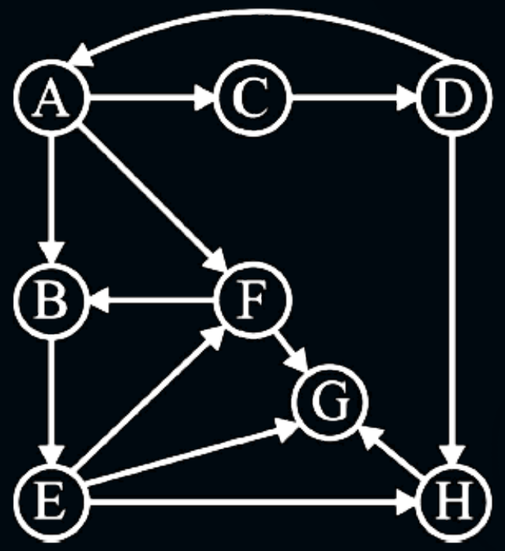
3) Back: None

4) Cross: UV, UR

(2).

[NAT] [2-Marks]

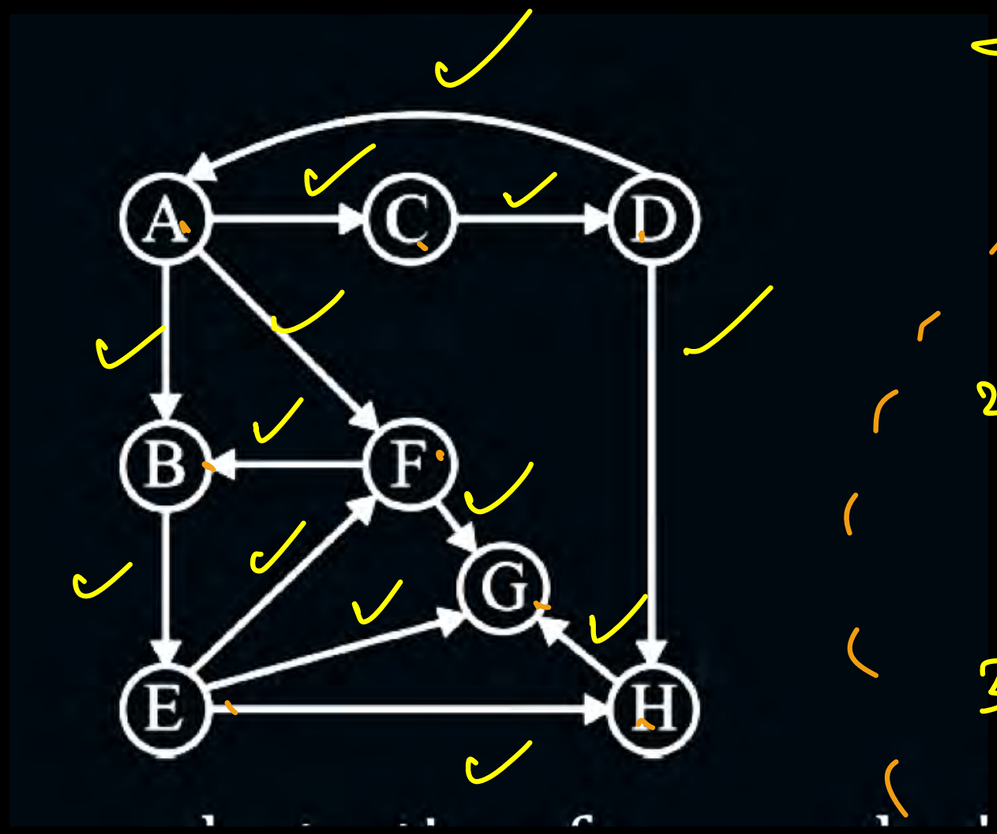
#Q. Consider the following graph



Ans: 4

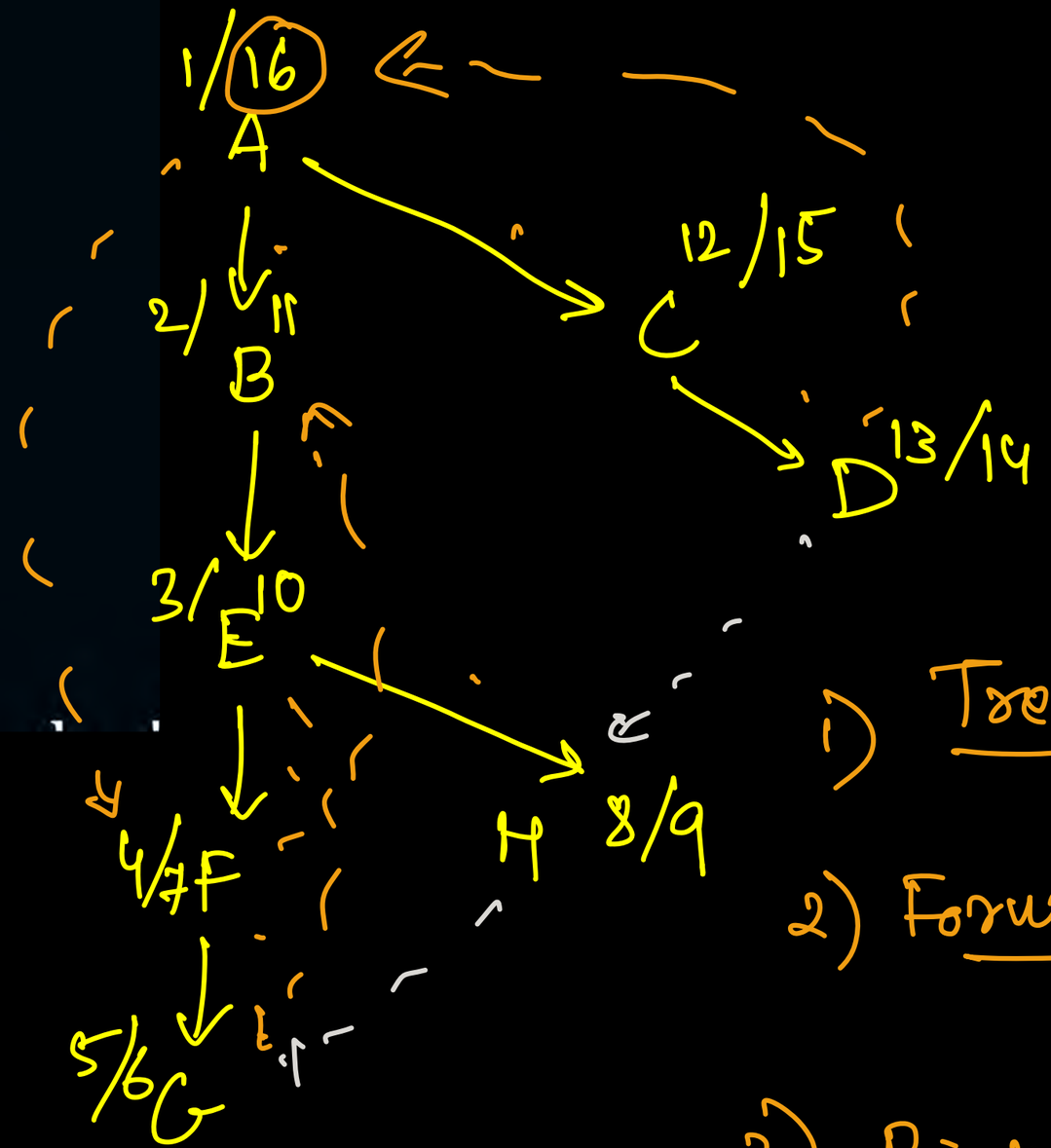
After applying DFS traversal starting from node 'A' in above graph if forward edges are x and cross edges are y then, $(x)^y$ is-

NOTE: Visit adjacent nodes in lexicographical order(B before C)



n = 8

DFS Start at A



1) Tree : 7.

2) Forward : AF, EG
(2).

3) Back : DA, FB
(2).

4) Cross : HG, DH → (2).

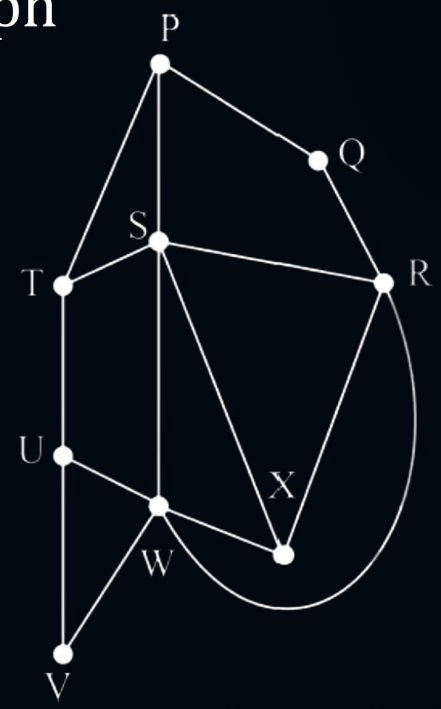
$x = 2$

$y = 2$

$x^y = 2^2 = \boxed{4}$

[MSQ] [2-Marks]

#Q. Consider the following graph



Ans :- (A, C)

Which of the following represents the valid DFS traversal?

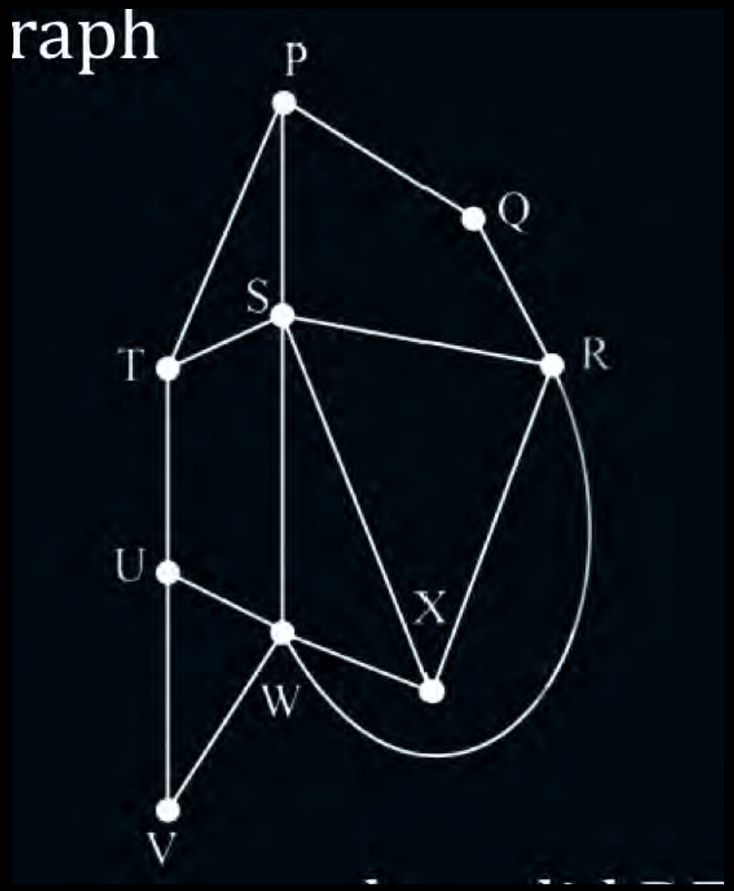
A P S W U T V X R Q

B X S P T Q R W V U

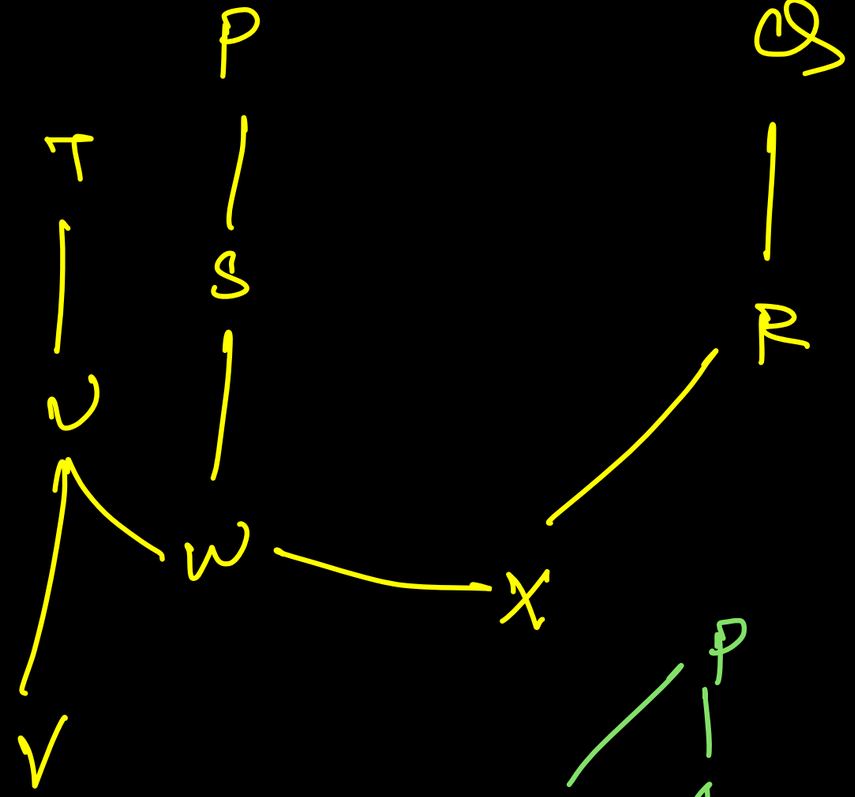
C V W X R Q P S T U

D T S P W U V X R Q

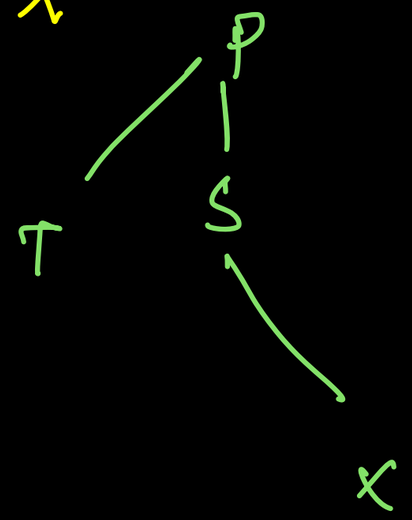
raph



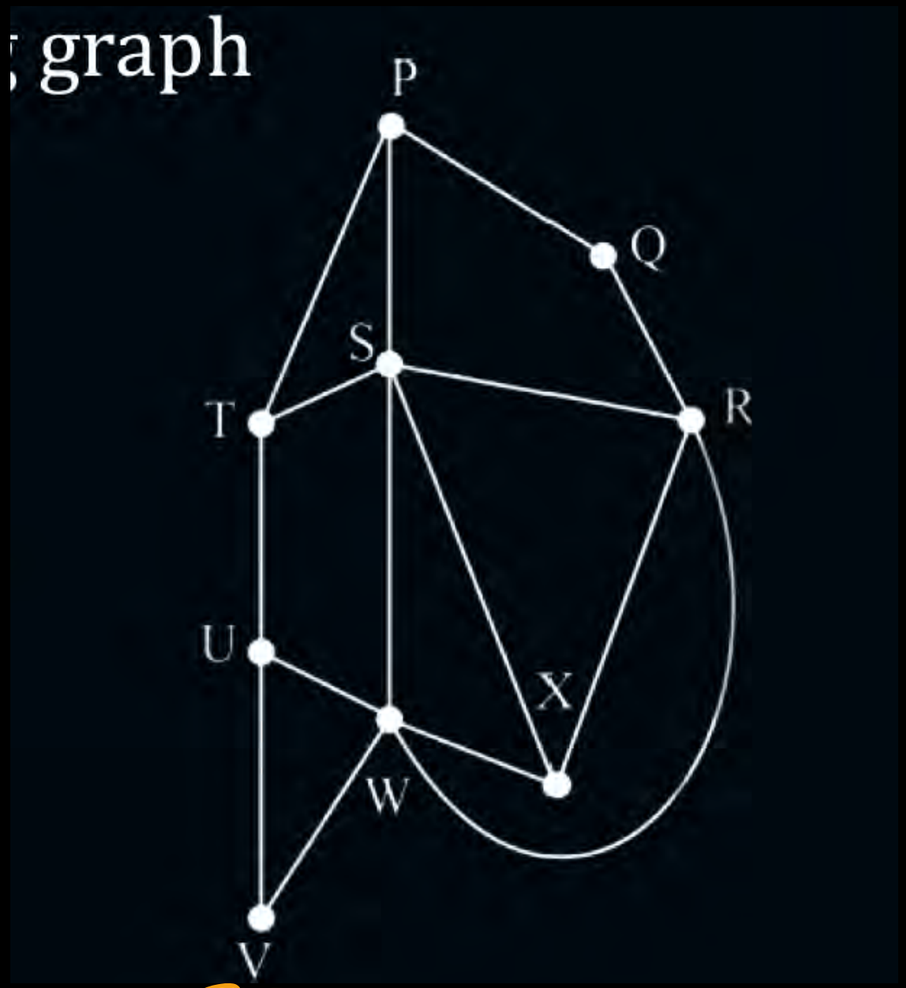
A) P S W U T V X R Q



B) X S P T Q R W V U

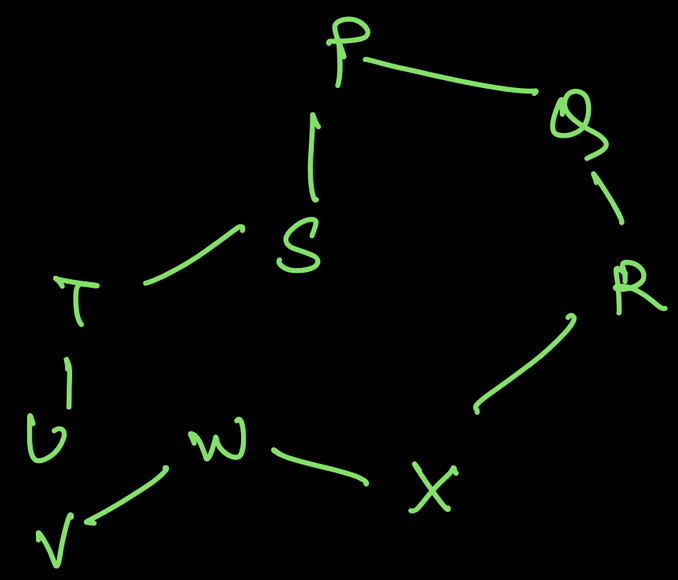


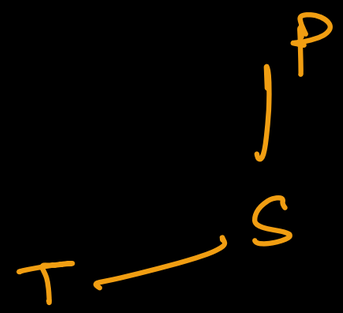
graph



D) T S P W U V X R Q

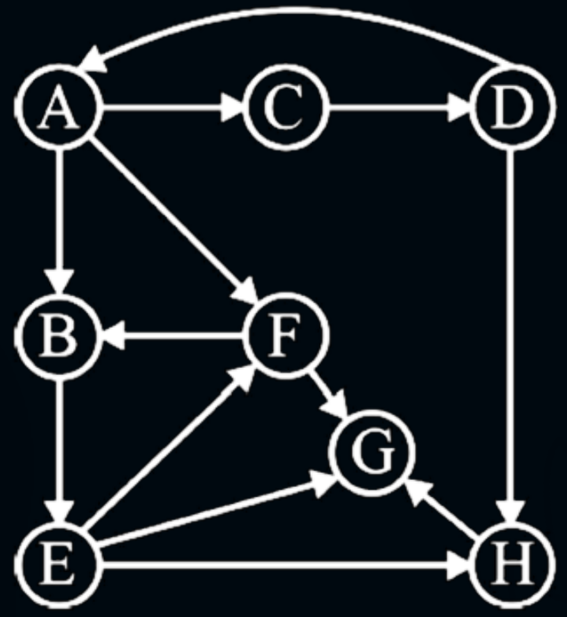
c) V W X R Q P S T U





[NAT] [2-Marks]

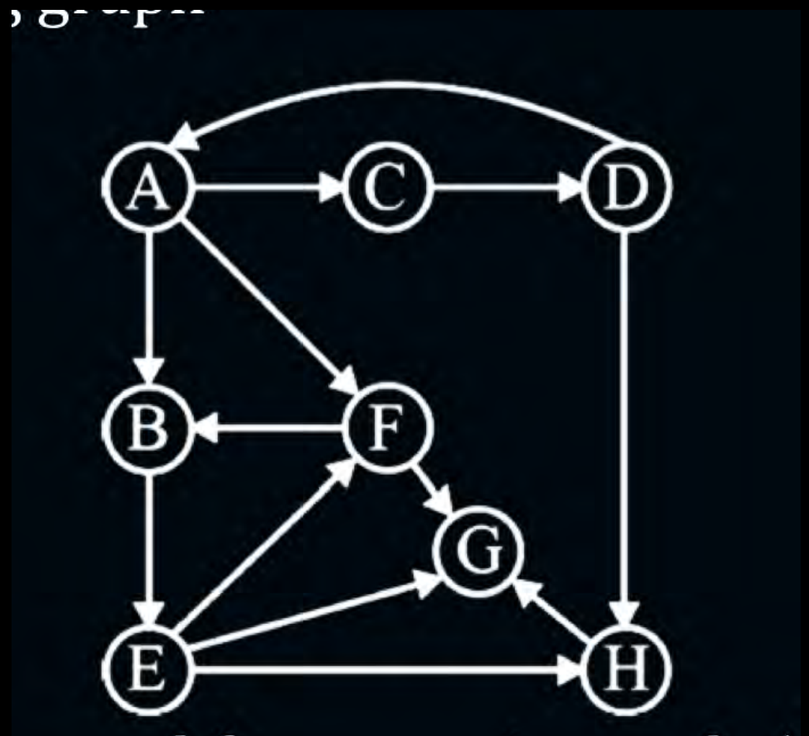
#Q. Consider the following graph

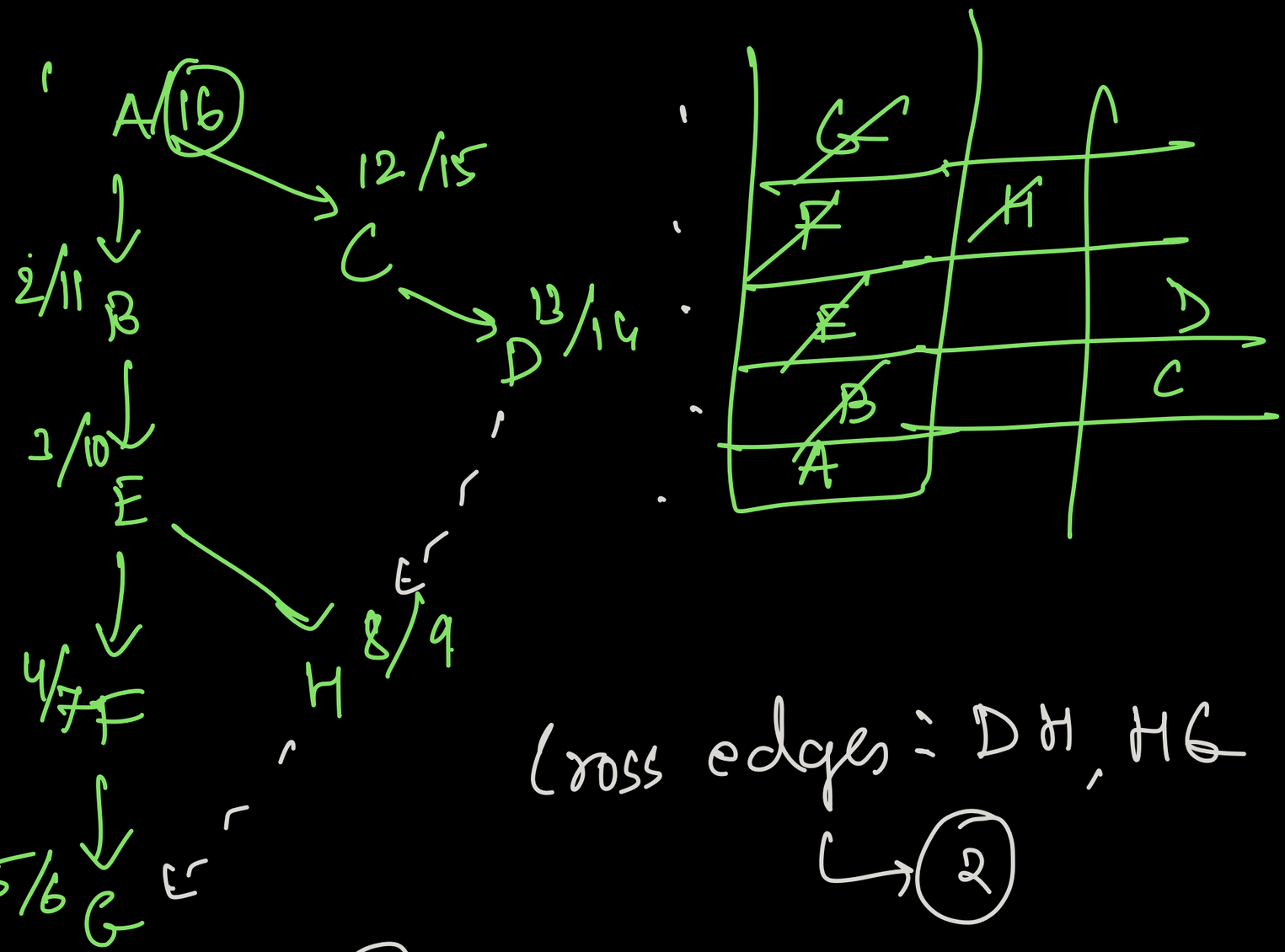


Ans: 9

After applying DFS traversal from starting node 'A' . If maximum stack size during DFS is P and number of cross edges are 'Q' then P + 2Q is___.

NOTE: Visit adjacent nodes in lexicographical order(B before C)





$n = 8$

$8 \times 2 = \underline{\underline{16}}$

Cross edges : DH, HG

↳ (2)

$P + 2Q = 5 + 2 \times 2 = \underline{\underline{9}}$

$\Leftarrow \begin{cases} Q = 2 \\ P = 5 \end{cases}$

[MSQ] [2-Marks]

#Q. Which of the following statements is/are false?

Ans:- A, D

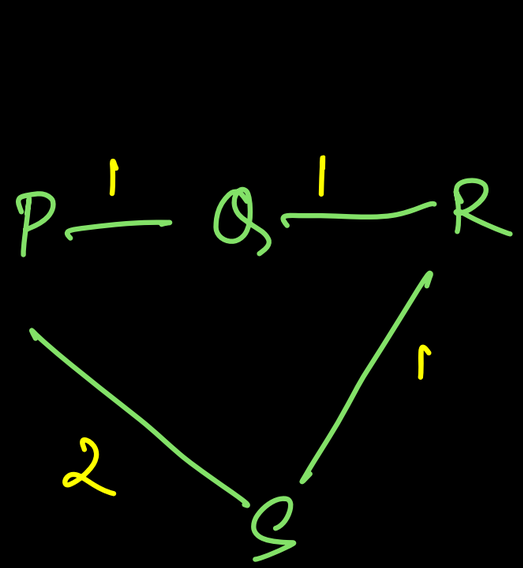
A. In an undirected graph, the shortest path between two nodes always lies on some minimum spanning tree — False

B. If every edge of the graph has distinct weight, then highest weight spanning tree is unique. — T

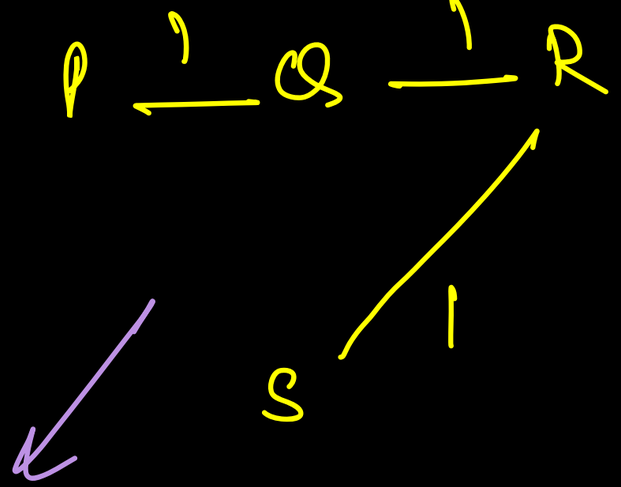
C. In Huffman coding, the item with the second lowest probability is always at the leaf that is farthest from the root — True

D. In Huffman coding, the item with the highest probability is always at a leaf that is the child of the root. — False

A)



MCST

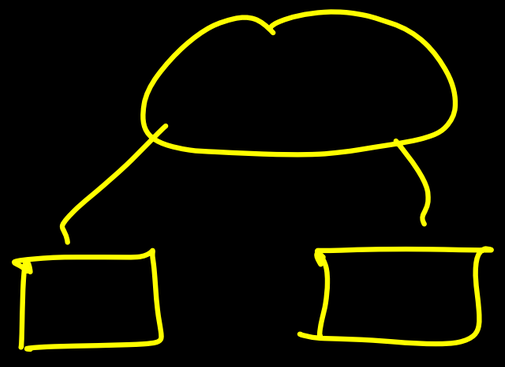


Shortest Path :

P → S : 2 ✓

P → S : P − Q − R − S

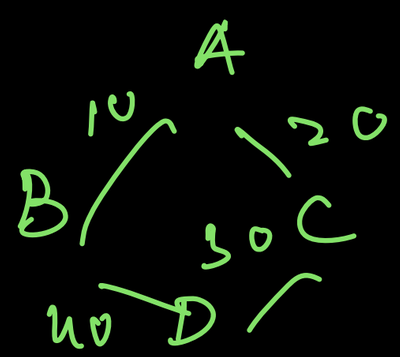
= 1 + 1 + 1 = 3



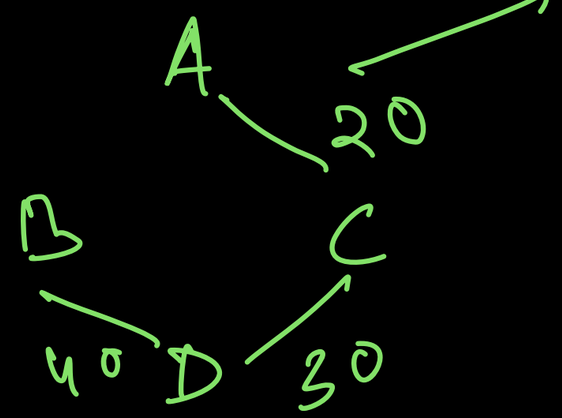
m1

m2 → lowest

(B) Kruskal



→



→ max CST

Check option D:

Qq:- 1)

P – 10 ✓

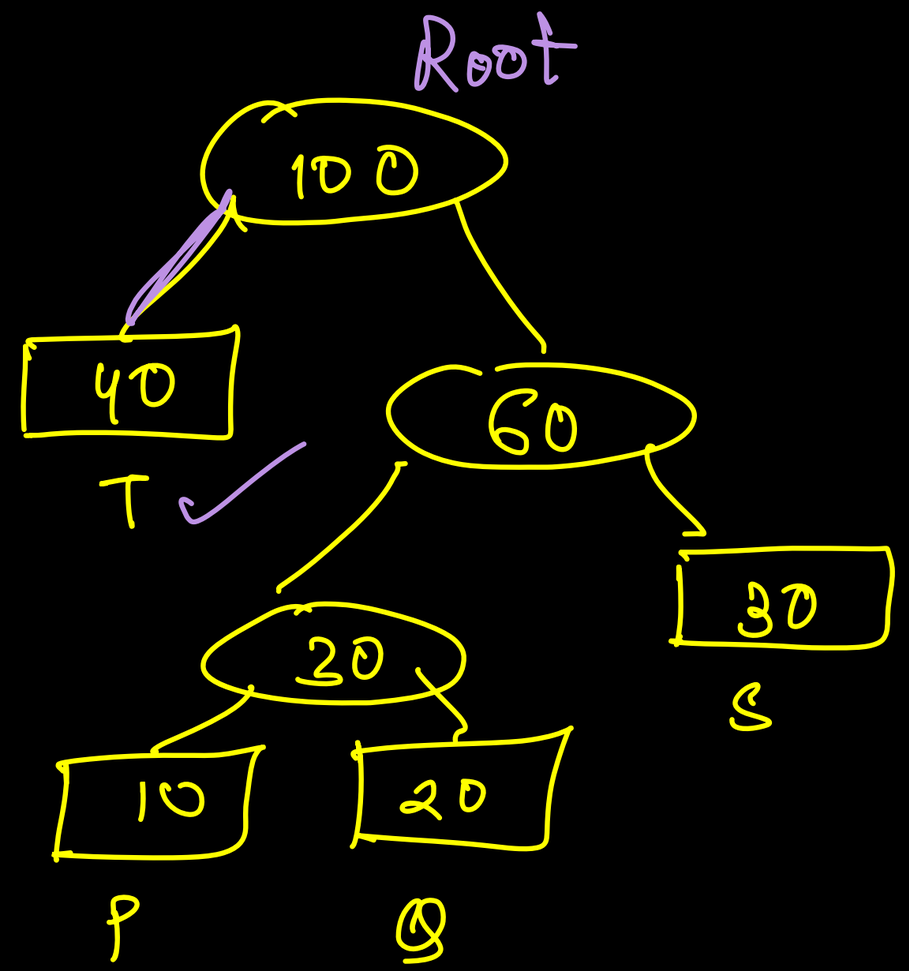
Q – 20 ✓

S – 30 ✗

T – 40 ✓

=

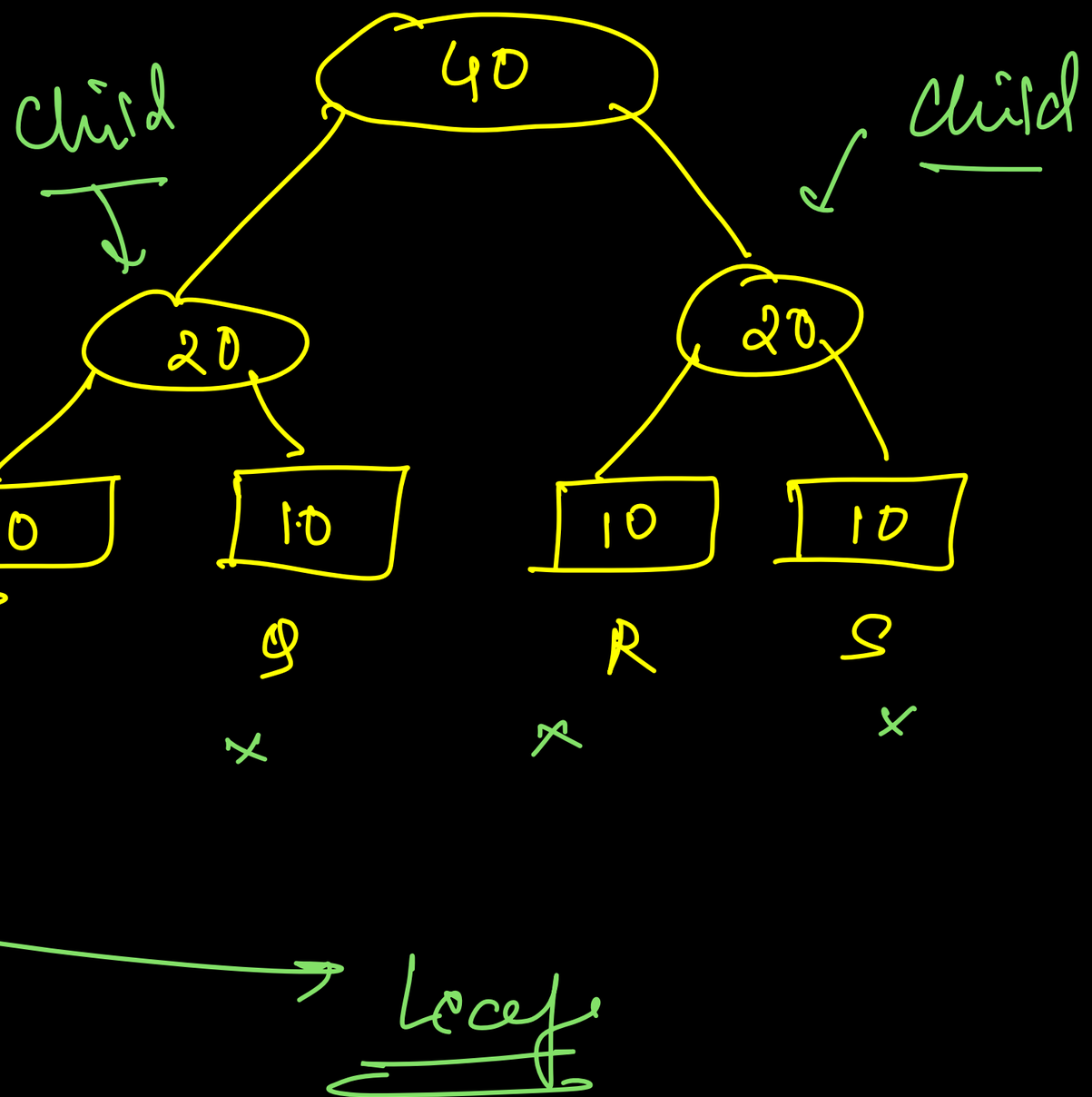
Valid



eg 2 :

P — 10
Q — 10
R — 10
S — 10

10, 10, 20, 20



THANK - YOU