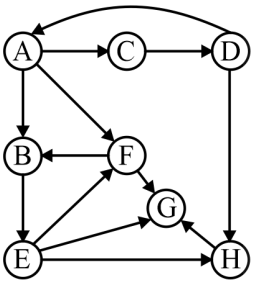
Algorithms

Graph Algorithms and Miscellaneous

Q1 Suppose, G is a undirected connected complete graph with 4 vertices. How many BFS traversals are possible for Graph G? _____

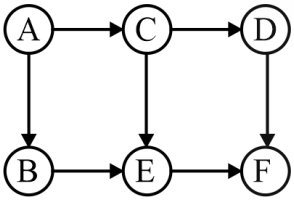
Q2 Consider the following graph



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

_____

Q3 Consider a following graph G:



How many topological orders are possible for graph G:

Q4 Consider the statements

S1: Starting from vertex V_0 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

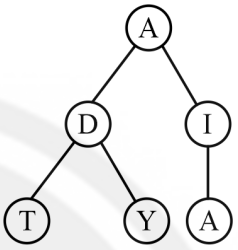
(A) Only S1

(B) Only S2

(C) Both S1 and S2

(D) Neither S1 Nor S2 is true

Q5 Consider the following graph

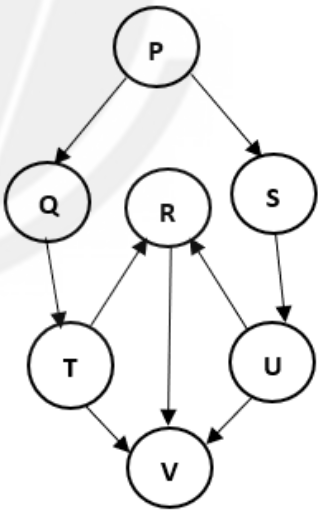


Which of the following is/are correct BFS traversal?

(A) ADITYA (B) AIADYT

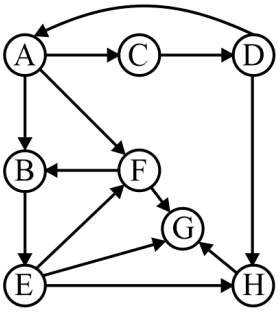
(C) YDATIA (D) DTYAIA

Q6 Consider the following Graph G:



Apply DFS on G starting at vertex P and selection of adjacent vertex in DFS divided 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 _____.

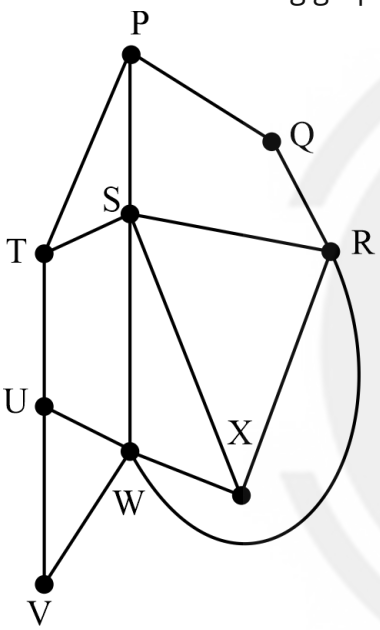
Q7 Consider the following graph



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)

Q8 Consider the following graph.



Which of the following represents the valid DFS traversal?

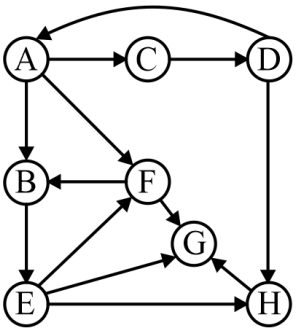
(A) P S W U T V X R Q

(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

Q9 Consider the following graph



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)

Q10 Which of the following statements is/are false?

(A) In an undirected graph, the shortest path between two nodes always lies on some minimum spanning tree

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

(C) In Huffman Encoding, the item with the secondlowest probability is always at the leaf that is farthest from the root

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

Answer Key

Q1	24
Q2	7
Q3	5
Q4	D
Q5	A, C, D
Q6	2
Q7	4
Q8	A, C
Q9	9
Q10	A, D

Hints & Solutions

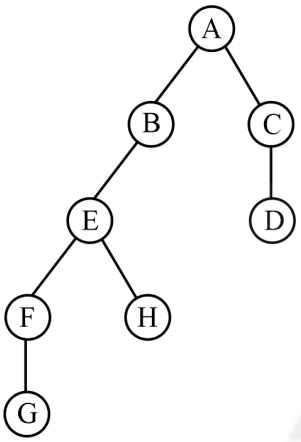
Note: scan the QR code to watch video solution

Q1 Text Solution:

Complete graph with n vertices having n! BFS traversals.

Therefore for 4 vertices having 24 BFS traversals.

Q2 Text Solution:



The edges = AB, AC, BE, CD, EF, EH, FG

Number of tree edges = Number of nodes – 1

= 8 – 1

= 7

Q3 Text Solution:

Starting vertex will be A and ending vertex will be F.

Topological order:

ABCDEF

ABCEDF

ACDBEF

ACBDEF

ACBEDF

5 orders are possible

Q4 Text Solution:

S1: Starting from vertex V_0 in a graph, the time required by DFS to find a path (if exists) to some vertex V is less than that is required by BFS. **FALSE**

S2: The space required by DFS is less than that is required by BFS. **FALSE**

Q5 Text Solution:

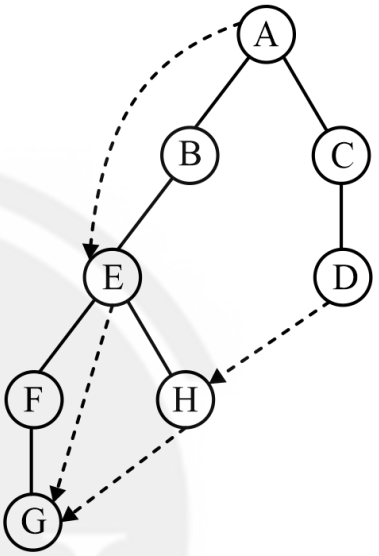
- ADITYA **Correct**
- AIADYT **Incorrect**
- YDATIA **Correct**
- DTYAIA **Correct**

Q6 Text Solution:

Number of cross edges = UV, UR = 2

Number of back edges = RP = 1

Q7 Text Solution:



Forward edges = EG, AF = 2

Cross edges = HG, DH = 2

$(x)^y = 2^2 = 4$

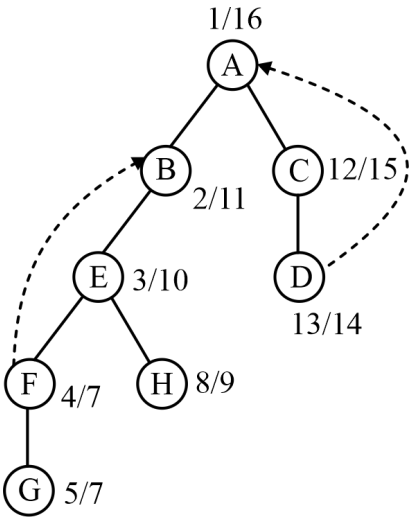
Q8 Text Solution:

Here only 2 options are invalid.

(i) B XSPTQRWVU is invalid because, without exploring all nodes neighboring to T, backtracking has been performed rest all can be verified using DFS traversal.

(ii) D TSPWUVXRQis invalid because, as we can see that there is no path to traverse from vertex T to P.

Q9 Text Solution:



Maximum depth of the stack is P=5

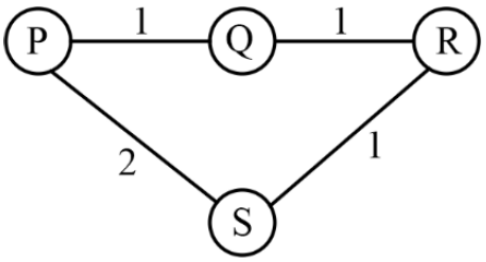
Cross edges = 2 (FB, DA)

P + 2Q = 5 + 2 × 2 = 9

Q10 Text Solution:

(a) False

Eg:



Shortest path: P S

(b) True: Just by taking negative weight and applyingprims' and Kruskal's we get unique weight whichis also unique MST.

(c) True: we choose lowest and 2nd lowest for thefarther leaves

(d) False:

Eg: