

Doubt Clearing Session

Course on C-Programming & Data Structures: GATE - 2024 & 2025

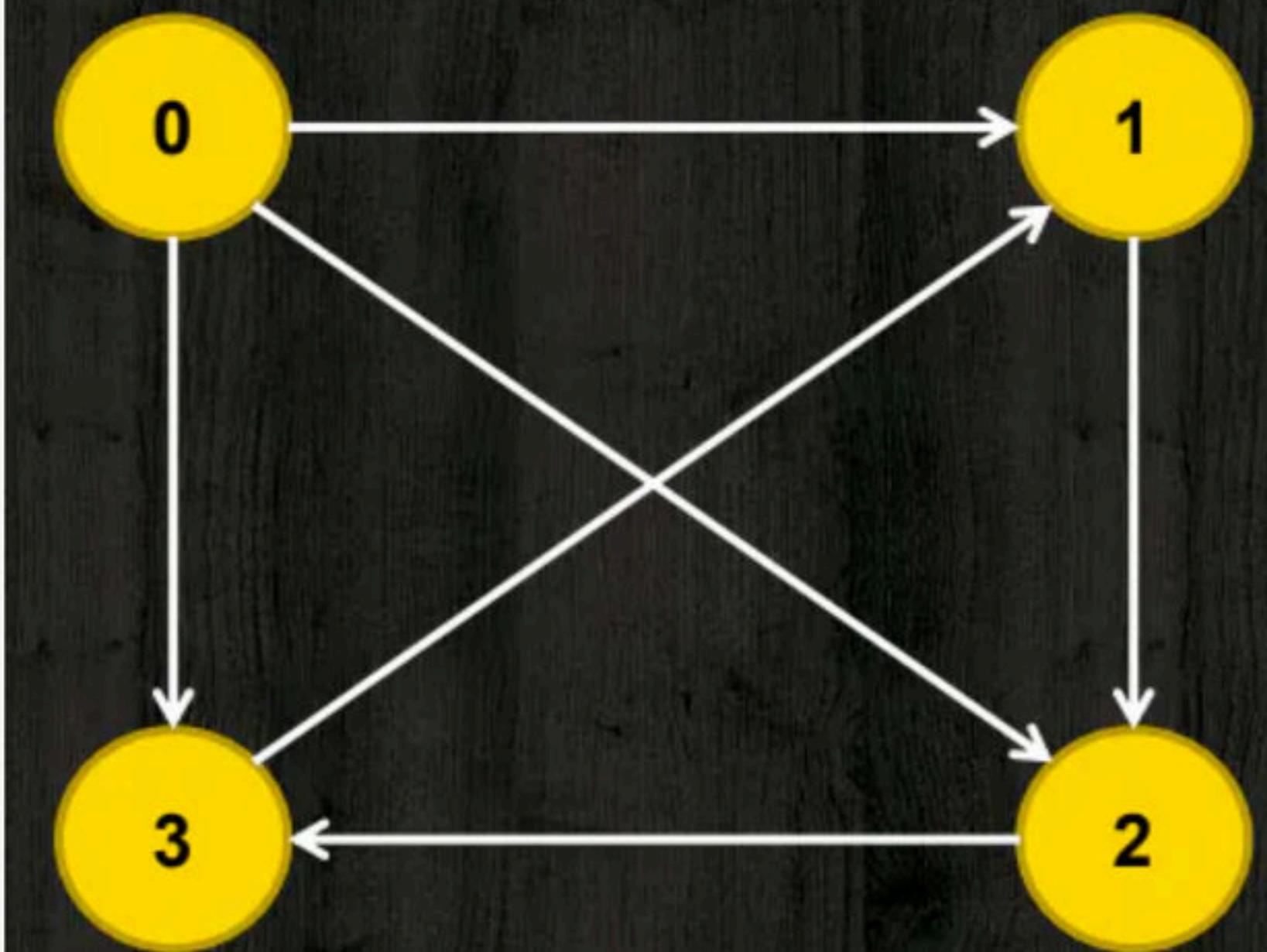
Data Structure

Graph: 2

By: Vishvadeep Gothi

Graph

Graph Representation

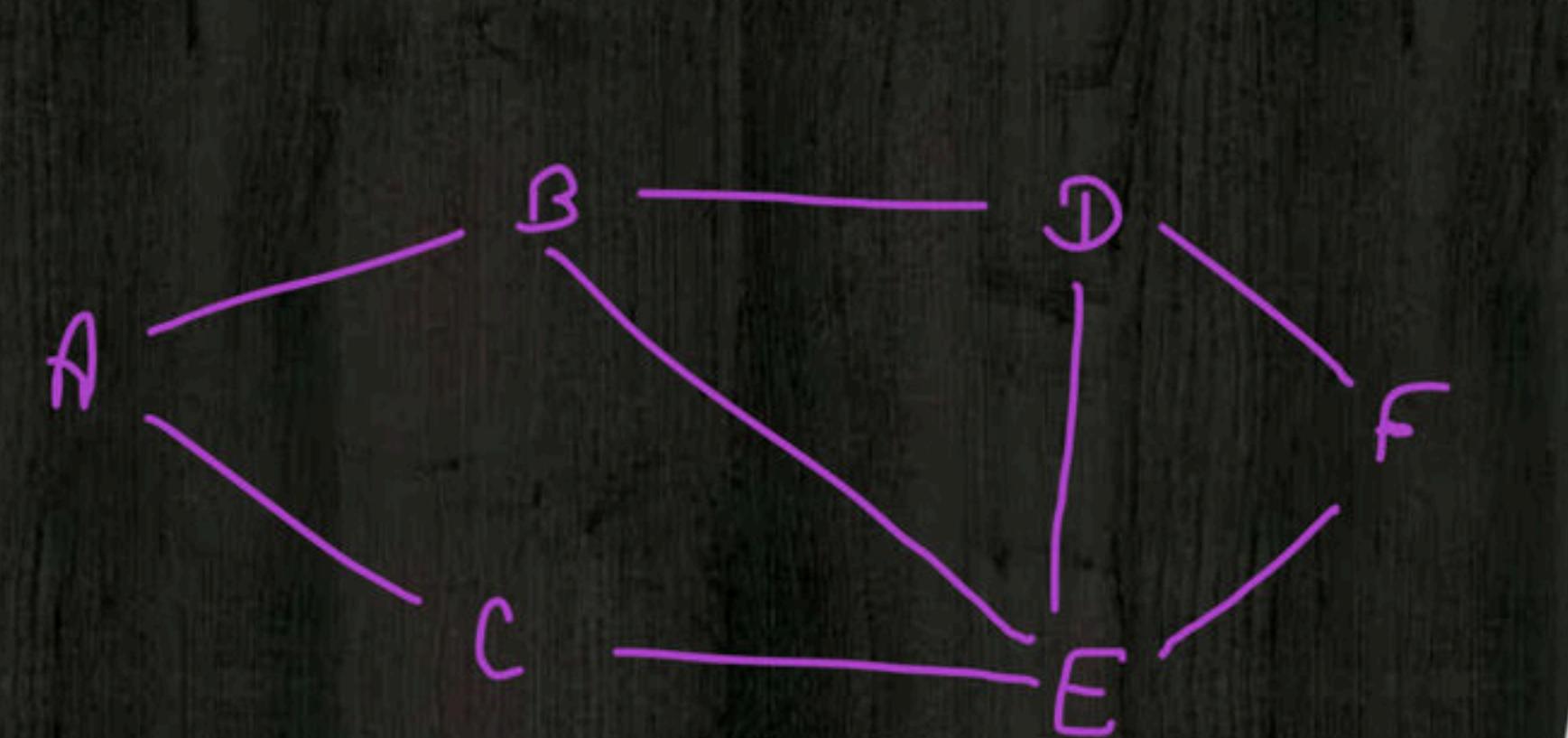


Graph Traversals

BFS

BFS: Using Queue

DFS



Source:- A

A, B, E, C, D, F

Source:- E

E, B, A, C, D, F

correct DFS or not?

✓1. CABEFD

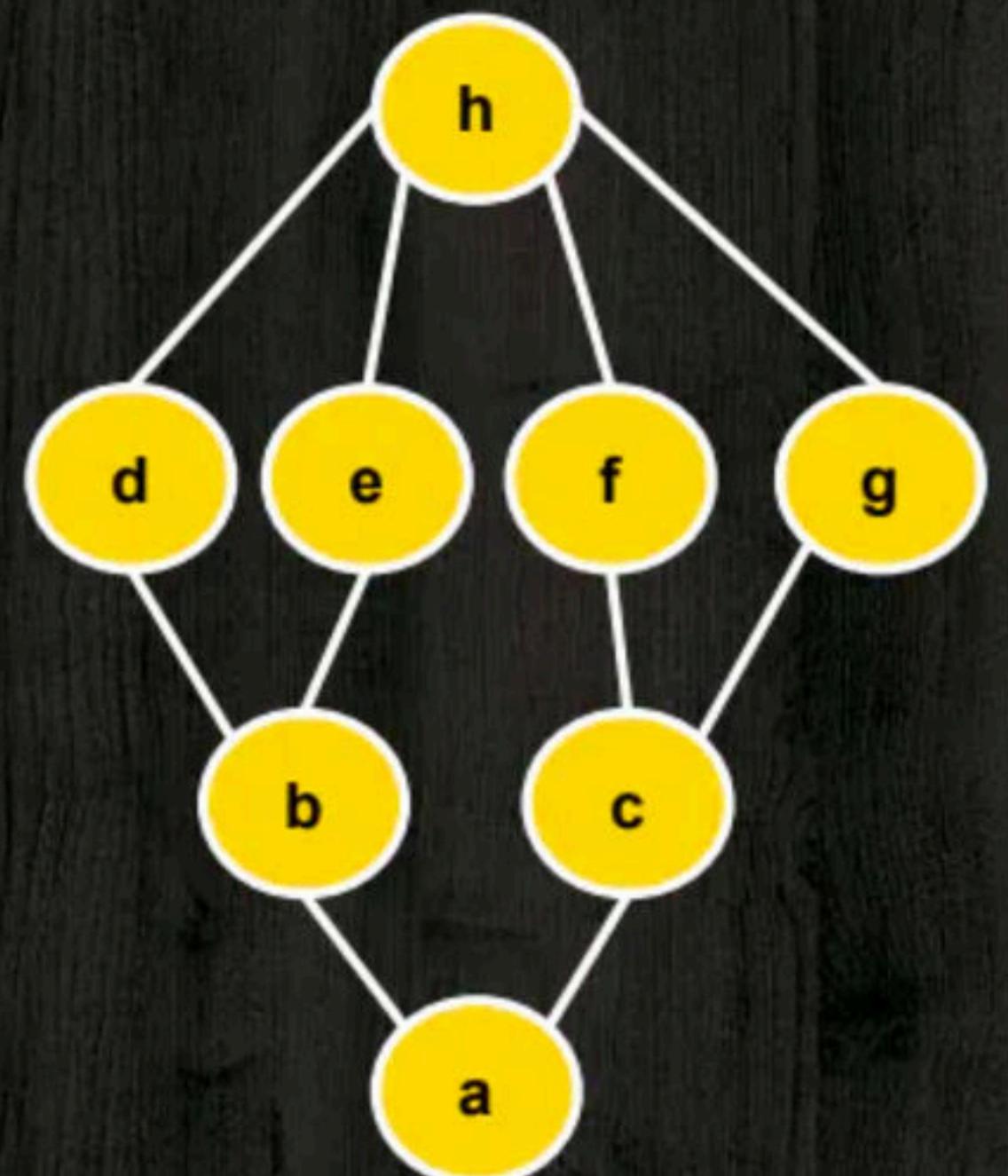
✗2. CEBAFD

✓3. EDFBAC

✓4. DBEFC

✗5. FDEBCA

Question 3



Identify valid or invalid DFS sequences:

- 1. a, b, e, h, f, g, d, c
- 2. a, c, f, h, g, e, b, d
- 3. a, b, e, h, d, f, c, g
- 4. a, c, f, h, e, b, d, g

DFS Using Stack

DFS(u)

{

1. mark u as visited
2. Traverse/print u
3. for all unvisited neighbours v for u
 DFS(v)

}

Question 1

A graph is represented as follows:

Perform DFS on given graph with source as vertex 1

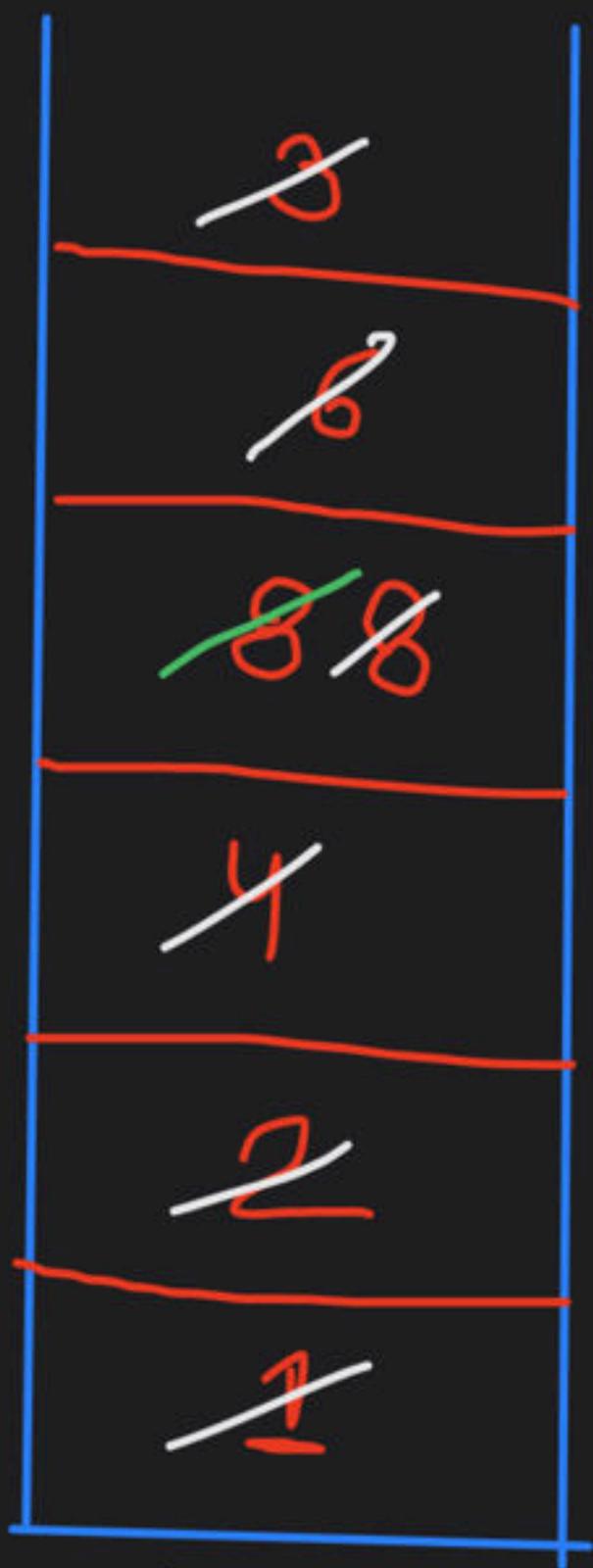
Get the following:

1. Traversal sequence $\underline{1}, 2, 4, 8, \underline{5}, 6, 3, 7$
2. Vertex which are not pushed onto the stack $\underline{5}, 7$
3. Vertex which are pushed onto stack more than once 8

Vertex	Adjacency
$\checkmark 1$	2, 3
$\checkmark 2$	1, 4, 5
$\cancel{3}$	1, 6, 7
$\checkmark 4$	2, 8
$\checkmark 5$	2, 8
$\checkmark 6$	3, 8
$\checkmark 7$	3, 8
$\checkmark 8$	4, 5, 6, 7

Traversal :— 1, 2, 4, 8, 5, 6, 3, 7

function execution :— 1 2 4 8 5 6 3 7 3 6 8 4 2 1

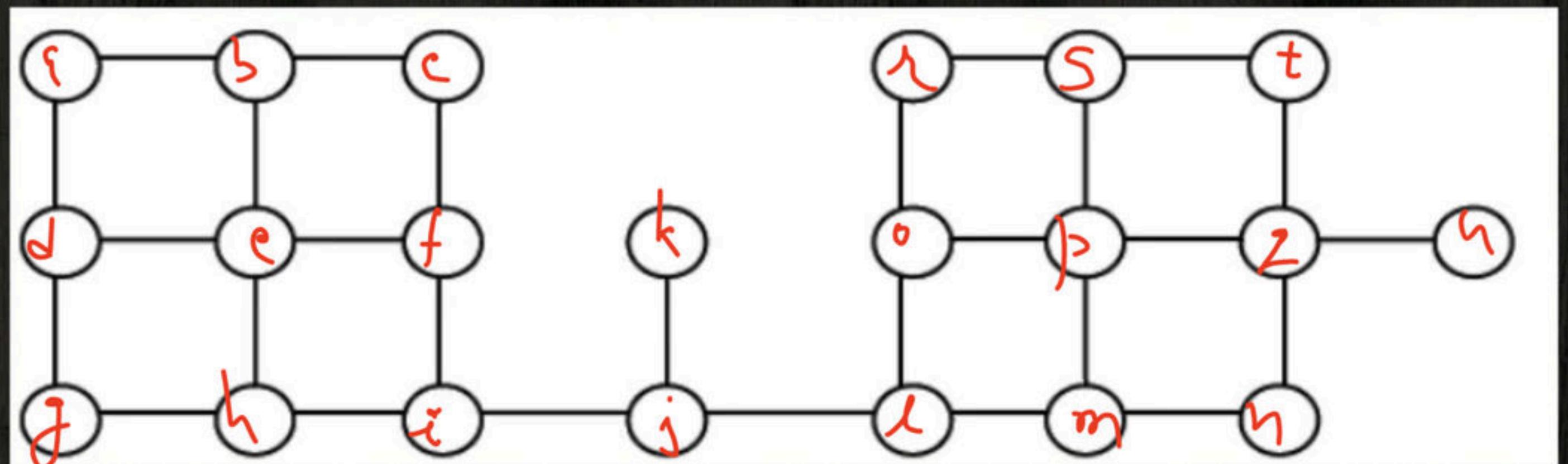


Stack

Question 4 GATE-2014

Ans = 19

Suppose depth first search is executed on the graph below starting at some unknown vertex. Assume that a recursive call to visit a vertex is made only after first checking that the vertex has not been visited earlier. Then the maximum possible recursion depth (including the initial call) is _____.



a → b → c → f → e → d → g → h → i → j → k (1)

↓

λ

↓

η

↓

(15) u ← q ← n

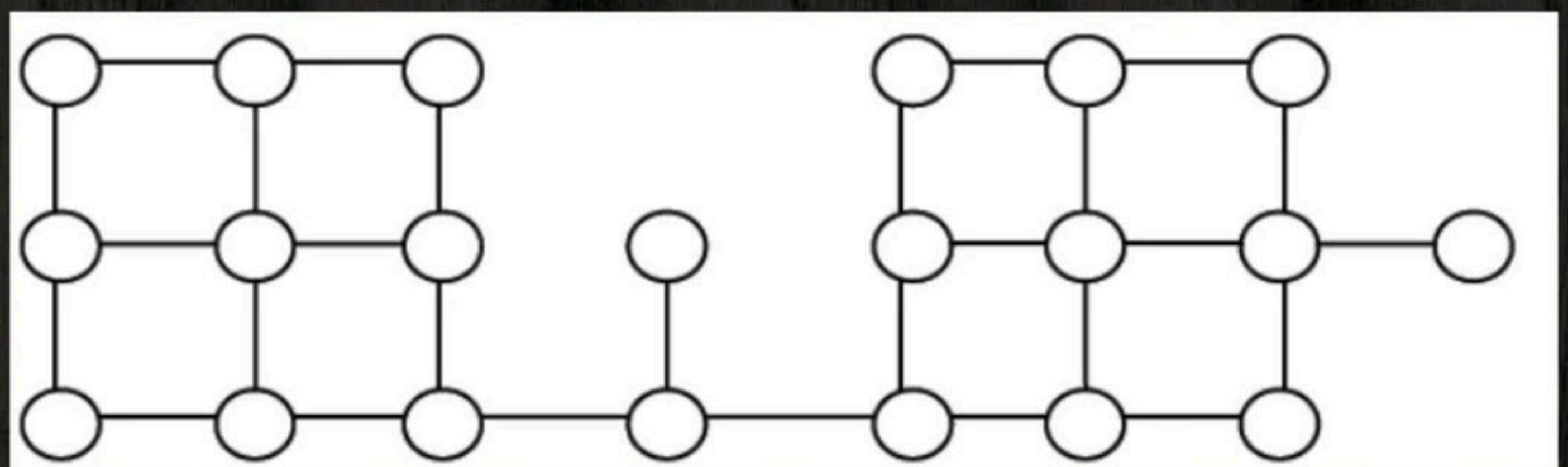
β

γ

(19) t ← s ← r ← g

Question 5

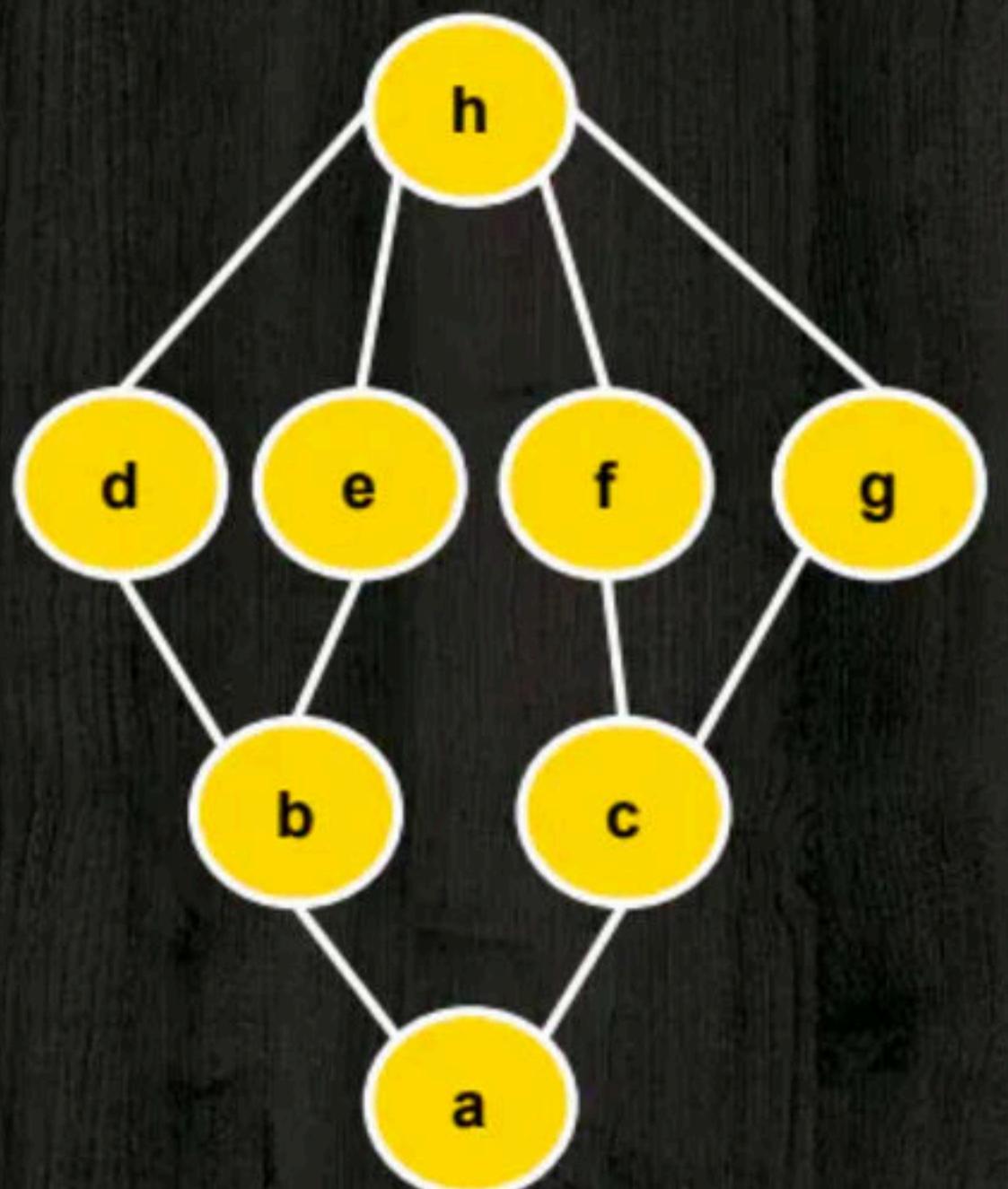
Suppose depth first search is executed on the graph below starting at some unknown vertex. Assume that a recursive call to visit a vertex is made only after first checking that the vertex has not been visited earlier. Then the maximum possible recursion depth in best case (including the initial call) is _____.





DPP

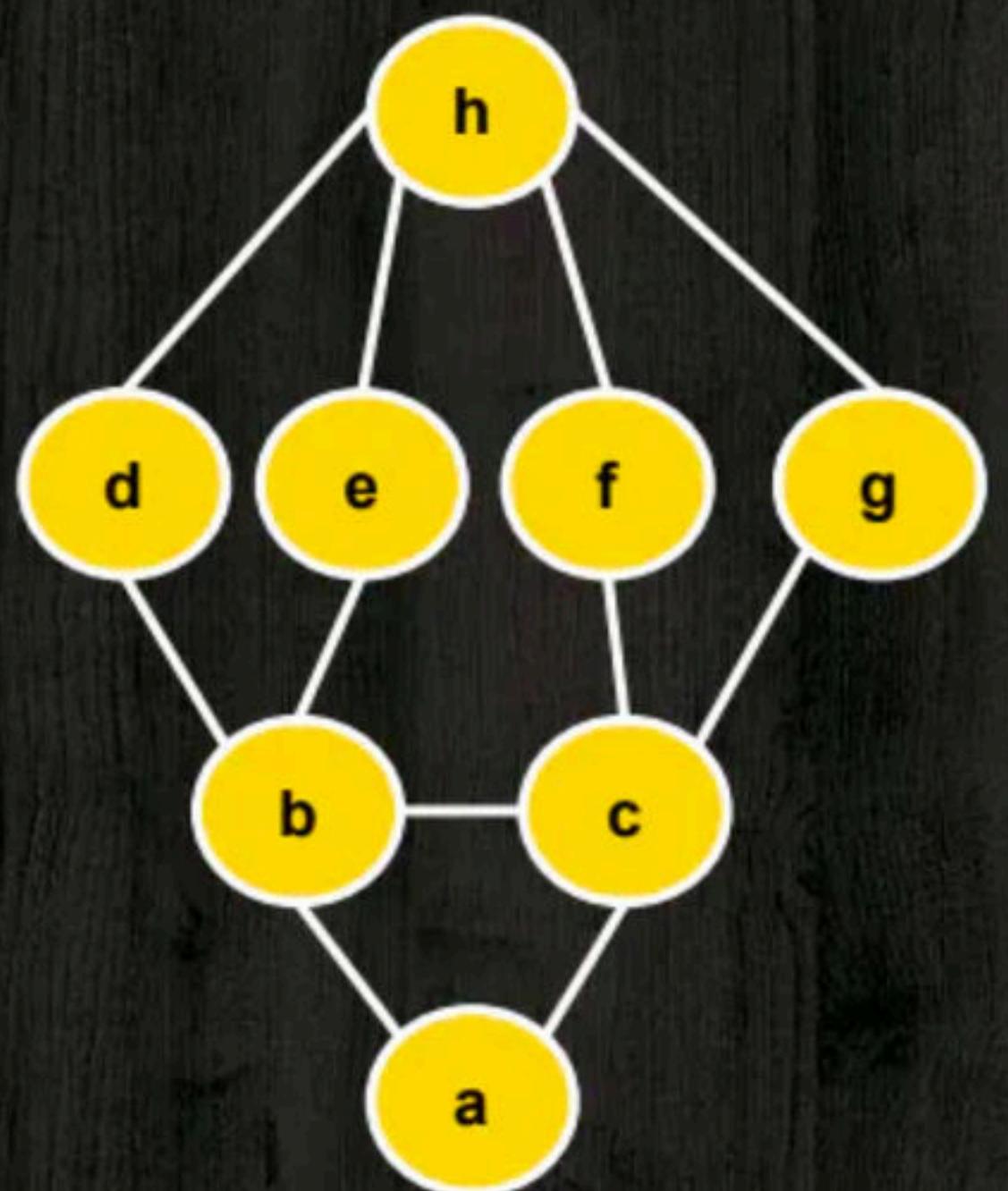
Question 1



Identify valid or invalid DFS sequences:

- 1. h, d, b, e, a, c, f, g
- 2. h, f, c, g, a, b, d, e
- 3. h, d, e, b, a, c, f, g
- 4. h, g, c, f, a, b, e, d

Question 2



Identify valid or invalid DFS sequences:

- 1. abcfhdeg ✓
- 2. abdhfgce ✗
- 3. abdhgcfe ✓
- 4. acbdhegf ✓
- 5. acfhgdeb ✗
- 6. acghebdf ✓
- 7. acbehfgd ✓

Question 3

A graph is represented as follows:

Vertex	Adjacency
1	2, 3
2	1, 4, 5
3	1, 6, 7
4	2, 8
5	2, 8
6	3, 8
7	3, 8
8	4, 5, 6, 7

If BFS is executed on this graph starting from vertex 1 using a queue then what is the content of the queue at the end of processing of vertex 4.

Question 4

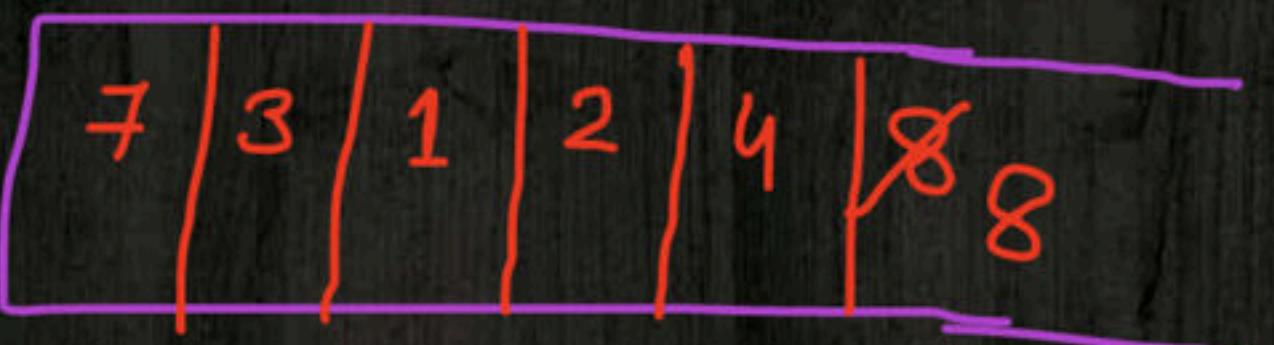
A graph is represented as follows:

Perform DFS on given graph with source as vertex 7

Get the following:

1. Traversal sequence $\textcolor{red}{7, 3, 1, 2, 4, 8, 5, 6}$
2. Vertex which are not pushed onto the stack $\textcolor{violet}{5, 6}$
3. Vertex which are pushed onto stack more than once $\textcolor{violet}{8}$

Vertex	Adjacency
$\checkmark 1$	2, 3
$\checkmark 2$	1, 4, 5
$\checkmark 3$	1, 6, 7
$\checkmark 4$	2, 8
$\checkmark 5$	2, 8
$\checkmark 6$	3, 8
$\checkmark 7$	3, 8
$\checkmark 8$	4, 5, 6, 7



Execution:-

Question 5

A graph is represented as follows:

Perform DFS on given graph with source as vertex 8

Get the following:

1. Traversal sequence $8, 4, 2, 1, 3, 6, 7, 5$
2. Vertex which are not pushed onto the stack $6, 7, 5$
3. Vertex which are pushed onto stack more than once $3, 2$

Vertex	Adjacency
1	2, 3
2	1, 4, 5
3	1, 6, 7
4	2, 8
5	2, 8
6	3, 8
7	3, 8
8	4, 5, 6, 7

Question 6

A graph is represented as follows:

Perform DFS on given graph with source as vertex 4

Get the following:

1. Traversal sequence 4, 2, 1, 3, 6, 8, 5, 7
2. Vertex which are not pushed onto the stack 5, 7
3. Vertex which are pushed onto stack more than once 8

Vertex	Adjacency
1	2, 3
2	1, 4, 5
3	1, 6, 7
4	2, 8
5	2, 8
6	3, 8
7	3, 8
8	4, 5, 6, 7

Happy Learning