

Week 4: PYQs

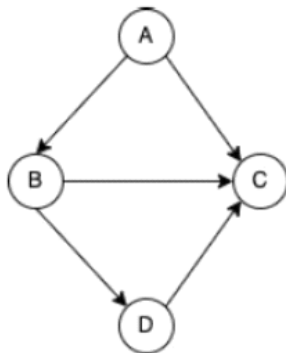
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Topological Sorting / Longest Path:

1. Jan 2024, End Term

Question Label : Multiple Choice Question

Consider the graph given below



Which of the following is the correct topological ordering of the given graph?

Options :

☐ A - B - C - D

☐ A - C - D - B

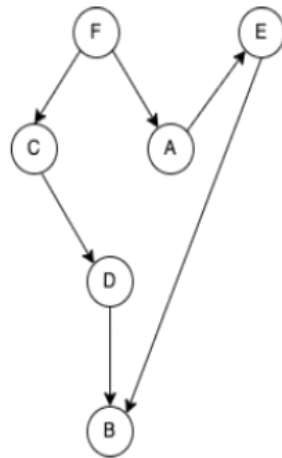
☐ A - C - B - D

☐ A - B - D - C

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2. Jan 2024, Quiz 1

Consider the following DAG:



The number of different topological orderings of the vertices of the given graph is ____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

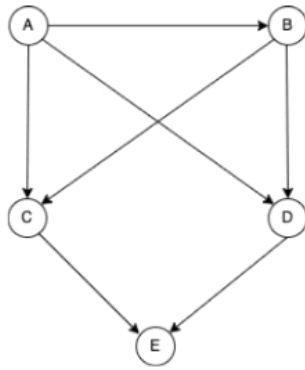
Possible Answers :



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3. Sep 2023, Quiz 1

Consider the following Directed Acyclic Graph(DAG):



The number of possible topological order(s) for the given graph is_____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :



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4. Sep 2023, End Term

A house is being rewired. The house has **10** rooms named from **A** to **J**. To avoid wires getting entangled and creating short circuits, the electricians have been asked to observe the following rules.

- Room A must be rewired before room D.
- Room B must be rewired before room F.
- Room C must be rewired before room E.
- Room D must be rewired before room F.
- Room E must be rewired before room F.
- Room F must be rewired before rooms G, H, and I.
- Room G must be rewired before room H.
- Room H must be rewired before rooms I and J.
- Room I must be rewired before room J.

It takes one full day to rewire a room. There are enough electricians to rewire as many rooms as can be rewired in parallel, keeping in mind the constraints above. What is the minimum number of days required to complete the job?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

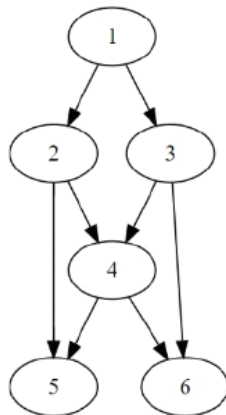
Possible Answers :



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5. May 2023, Quiz 1

Question Label : Multiple Select Question
Consider the following DAG



Which of the following is/are **not a valid** topological orderings for the given DAG?

Options :

- ☐ 1 2 3 4 5 6
- ☐ 1 3 4 2 5 6
- ☐ 1 3 2 4 5 6
- ☐ 1 3 2 5 4 6
- ☐ 1 2 4 3 5 6

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BFS:

1. Jan 2024, End Term

Question Label : Multiple Select Question

Consider an undirected unweighted graph G with following set of vertices (V) and edges (E):

$$V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7\}$$

$$E = \{(v_1, v_2), (v_1, v_3), (v_1, v_4), (v_2, v_4), (v_2, v_5), (v_3, v_4), (v_5, v_7), (v_5, v_6), (v_2, v_7)\}.$$

A Breadth First Search(BFS) on the graph G is performed with v_1 as start vertex. Which of the following is/are the tree edge(s)?

Options :

- ☐ (v_2, v_4)
- ☐ (v_1, v_4)

[REDACTED] (v_1, v_4)

[REDACTED] (v_2, v_5)

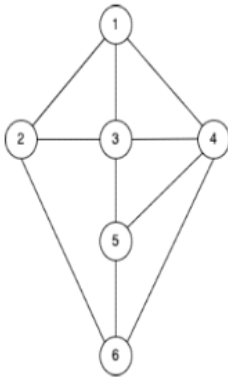
[REDACTED] (v_5, v_7)

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2. Jan 2024, Quiz 1

Question Label : Multiple Choice Question

Consider the following graph



Which of the following vertex sequence is possible **BFS traversals** on the graph started from node 5? Assume that when a node has multiple neighbours, BFS would visit the numerically smaller valued node first.

Options :

[REDACTED] 5, 4, 3, 6, 1, 2

[REDACTED]

[REDACTED] 5, 3, 4, 6, 1, 2

[REDACTED] 5, 3, 4, 6, 2, 1

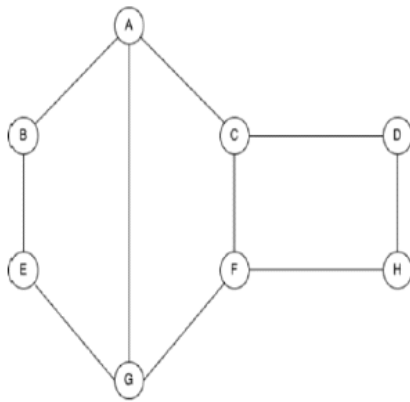
[REDACTED] 5, 6, 4, 3, 2, 1

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3. Sep 2023, Quiz 1

Question Label : Multiple Choice Question

Consider the following graph:



If we run Breadth First Search(BFS) on the given graph starting from vertex A, which of the following is the order of visiting the nodes?

Note: Assume that when a node has multiple neighbours, BFS visits them alphabetically.

Options :

ABCGEFDH

ABCGEDFH

ABCEFGDH

ABCGDEFH

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4. Jan 2024, End Term

Question Label : Multiple Choice Question

You are given a social network with users and their friendships represented as a graph. You want to find the shortest chain of friends between User A and User B. Which of the following algorithm is best suited and efficient for solving this problem?

Options :

6406532760425. ✓ Breadth-first search

6406532760426. ✗ Depth-first search

6406532760427. ✗ Dijkstra's Algorithm

6406532760428. ✗ Bellman-Ford algorithm

DFS:

1. Sep 2023, Quiz 1

Question Label : Short Answer Question

Suppose, in a depth-first traversal of an undirected graph G with 12 vertices, 9 edges are marked as tree edges. The number of connected components in G is ____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :



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2. May 2023, Quiz 1

Question Label : Multiple Choice Question

Consider the following statements:

1. While creating a DFS tree for a directed graph, among non-tree edges, only back edges correspond to cycles.
2. The depth of any DFS tree rooted at a vertex is at least as much as the depth of any BFS tree rooted at the same vertex.

Choose the correct option.

Options :

6406531929644. ✖ Only statement 1 is true

6406531929645. ✖ Only statement 2 is true

6406531929646. ✔ Both statements 1 and 2 are true

6406531929647. ✖ Both statements 1 and 2 are false

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Other Questions:

1. Jan 2024, End Term

Question Label : Multiple Choice Question

Consider the following code.

```
1 visited=[False for i in range(5)]
2 def fun(v,G):
3     print(v,end=",")
4     visited[v]=True
5
6     for i in range(5):
7         if not visited[i] and G[v][i]==1:
8             fun(i,G)
```

Consider the following adjacency matrix G .

$$G = \begin{bmatrix} 0,0,0,1,1 \\ 0,0,0,0,1 \\ 0,0,0,1,0 \\ 1,0,1,0,0 \\ 1,1,0,0,0 \end{bmatrix}$$

What will be the output produced by `fun(0,G)` ?

Options :

☐ 0,2,3,1,4,

☐ 0,3,2,1,4,

☐ 0,2,3,4,1,

☐ 0,3,2,4,1,

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2. Sep 2023, End Term

Question Label : Multiple Choice Question

A simple undirected connected graph G has 19 vertices. The sum of the degrees of all the vertices in G is d . The number of vertices of odd degree in G is k . Which of these values are possible for d and k ?

Options :

6406532324413. ✖ $d = 66, k = 9$

6406532324414. ✖ $d = 63, k = 9$

6406532324415. ✔ $d = 66, k = 8$

6406532324416. ✖ $d = 63, k = 8$

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Which of the following is/are possible degree sequence/(s) of vertices of a connected undirected graph with four vertices?

Note: Degree sequence is a series of positive integer a_1, a_2, \dots, a_n where each a_i is the degree of the i^{th} vertex of the graph.

Options :

☐ 3, 2, 1, 1

☐ 3, 3, 1, 1

☐ 3, 3, 2, 2

☐ 3, 3, 3, 3

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4.

Which of the following is/are possible degree sequence/(s) of vertices of a connected undirected graph with six vertices?

Note: Degree sequence is a series of positive integer a_1, a_2, \dots, a_n where each a_i is the degree of the i^{th} vertex of the graph.

Options :

6406531561953. ✖ 1, 1, 1, 1, 1, 1

6406531561954. ✔ 2, 2, 2, 2, 2, 2

6406531561955. ✔ 1, 1, 2, 2, 3, 5

6406531561956. ✖ 1, 2, 2, 2, 3, 3

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5.

Let G be an undirected connected graph and T be a breadth-first search tree for G , let x and y be nodes in T belonging to the levels i and j respectively, and let (x, y) be an edge of G . Then i and j differ by at most ____.

Options :

Options:

- a. 0
- b. 1
- c. 2


d. 3


6.

Question Label : Multiple Choice Question

Consider a connected, directed graph G on which **DFS** is executed. `pre` and `post` numbering is used in the DFS algorithm on the graph. In which of the following situations can we conclude that edge (u,v) is a **Back edge**?

Options :

 `pre[u] = 3, post[u] = 6, pre[v] = 1, post[v] = 10`

 `pre[u] = 7, post[u] = 8, pre[v] = 4, post[v] = 5`

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7. Jan 2024, Quiz 1

An undirected graph G has **5** vertices. The maximum number of edges in G is ____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :



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8. Sep 2023, Quiz 1

Question Label : Short Answer Question

Consider a **directed graph** G with **65** edges. What is the minimum number of vertices in G ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :



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9. May 2023, End Term

Question Label : Multiple Choice Question

An airline serves 1000 cities and runs 4500 direct flights each day between these cities. Which of

the following is a good data structure to get the list of cities where direct flight available from any particular cities?

Options :

☐ A 1000×1000 2d-array A, where $A[i][j] = 1$ if there is a direct flight from city i to city j and 0 otherwise.

☐ A stack containing values (i, j) for each pair of cities i, j for which there is a direct flight from city i to city j .

☐ A queue containing values (i, j) for each pair of cities i, j for which there is a direct flight from city i to city j .

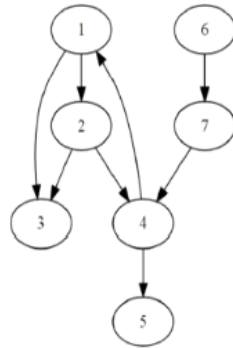
☐ An adjacency list containing values (i, j) for each pair of cities i, j for which there is a direct flight from city i to city j .

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DAG:

1. Sep 2023, End Term

In the given directed graph, removing one edge e makes it a directed acyclic graph(DAG). Which of the following can be the possible values of e ?



Options :

☐ 1 \rightarrow 3

☐ 2 \rightarrow 4

☐ 7 \rightarrow 4

☐ 4 \rightarrow 1

6406532324421. ☒ 1 \rightarrow 2

6406532324422. ☐ None, this is already direct acyclic graph.