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What are the essential elements of an algorithm?

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What is overall time for Kruskal's algorithm if the graph is sparse?

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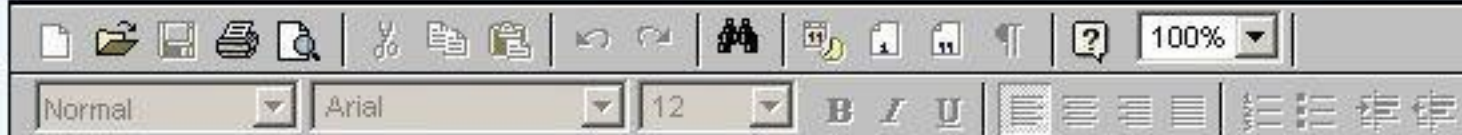


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What is DFS and how does it work?

Answer ([Please click here to Add Answer](#))

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What is Bellman-Ford algorithm's running time?

Answer ([Please click here to Add Answer](#))

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Explain the following two basic cases according to Floyd-Warshall Algorithm,

1. Don't go through vertex k at all.
2. Do go through vertex k.

Answer ([Please click here to Add Answer](#))

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Describe 2-d maxima problem in mathematical or algorithmic form.

Answer ([Please click here to Add Answer](#))

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Describe Minimum Spanning Trees Problem with examples.

Answer ([Please click here to Add Answer](#))

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Let the adjacency list representation of an undirected graph is given below:

Is there any isolated vertex? If yes, Name the vertex.

What general property of the list indicates that the graph has an isolated vertex?

a → b → c → e

b → a → d

Answer (Please [click here](#) to Add Answer)

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a → b → c → e
b → a → d
c → a → d → e → f
d → b → c → f
e → a → c → f

Answer ([Please click here to Add Answer](#))

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b → a → d
c → a → d → e → f
d → b → c → f
e → a → c → f
f → c → d → e
g

Answer ([Please click here to Add Answer](#))

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c → a → d → e → f
d → b → c → f
e → a → c → f
f → c → d → e
g

Answer ([Please click here to Add Answer](#))

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You are given the task of laying down new railway lines which will connect all n cities. Thus for any pair of cities, you will end up with track connecting them. Note that two routes may share the same track; track laid between Lahore and Islamabad can be used to travel in both directions. Your goal is to use the minimum amount of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloyed Warshal Algorithm

Answer (Please [click here](#) to Add Answer)

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A 100 km long track is being constructed starting from Lahore and Islamabad. There are two parallel tracks, you can use up to 100 km of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloyed Warshal Algorithm
- 4 Bellman Ford Algorithm.

Answer (Please [click here](#) to Add Answer)

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Show the result of time stamped DFS algorithm on the following graph. Take node E as a starting node. [You can show final result in exam software and need not to show all intermediate steps].

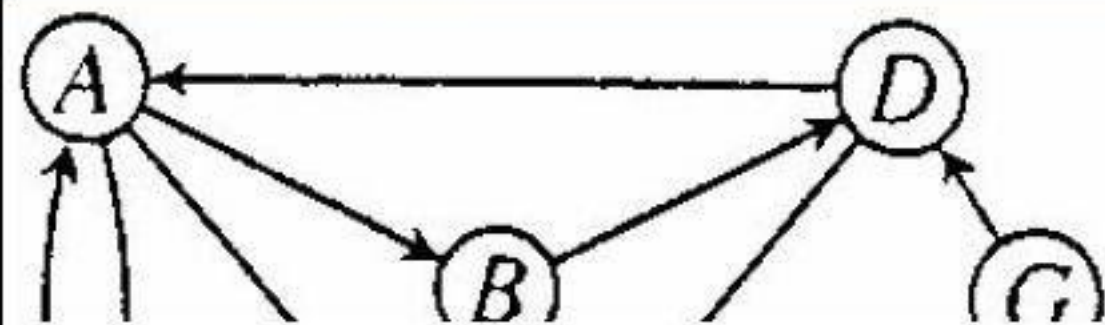


Answer (Please [click here](#) to Add Answer)

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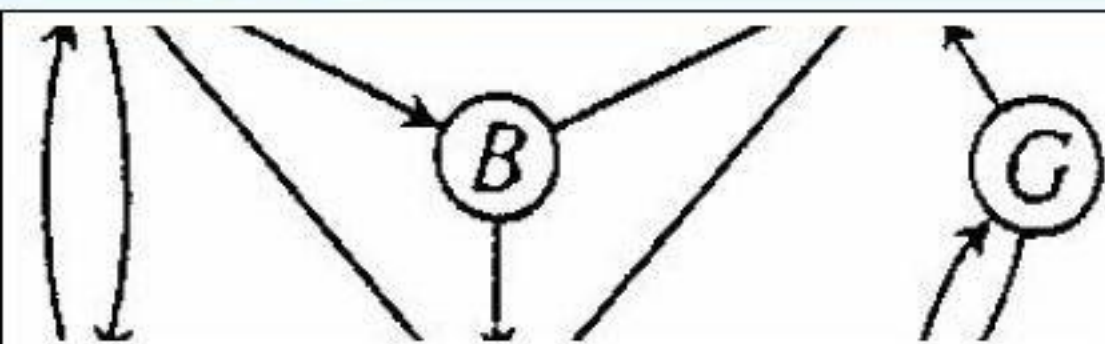


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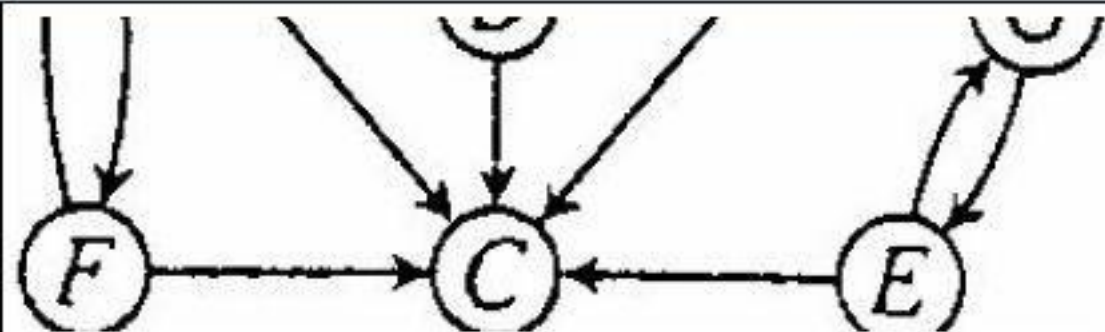


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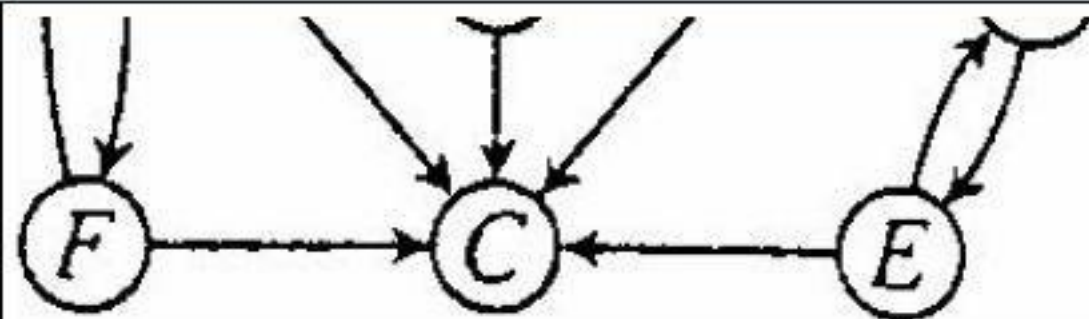


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Answer ([Please click here to Add Answer](#))

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Develop the running time complexity analysis for the following piece of code. Adopt step wise approach along with asymptotic notation at the end.

```
i=1
while (i < n) {
    i++
}
for ( i=1;i <= n ;i=i*2 )
```

Answer ([Please click here to Add Answer](#))

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```
i=1
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    i++
}
for ( i=1;i <= n ;i=i*2 )
for ( j = 1; j <= i; ++j )
```

Answer ([Please click here to Add Answer](#))

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Kruskal's algorithm can return different spanning trees for the same input graph G depending upon how ties are broken when edges are sorted. Prove that, for each minimum spanning tree T of G , there is a way to sort the edges of G in Kruskal's algorithm so that the algorithm returns T .

Answer ([Please click here to Add Answer](#))

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How we Heapify?

Answer ([Please click here to Add Answer](#))

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Define Back Edge

Answer ([Please click here to Add Answer](#))

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Given an adjacency list for G , what is the time complexity to compute G^T ?

Answer ([Please click here to Add Answer](#))

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What is Bellman-Ford algorithm's running time?

Answer ([Please click here to Add Answer](#))

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Given a digraph $G = (V, E)$, consider any DFS forest of G and consider any edge $(u, v) \in E$. Prove that if this edge is a tree, forward or cross edge, then $f[u] > f[v]$ and if this edge is a back edge, then $f[u] \leq f[v]$.

Answer ([Please click here to Add Answer](#))

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How the Dijkstra's algorithm works?

Answer ([Please click here to Add Answer](#))

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Modify QUICKSORT algorithm such that it sorts array into non-increasing order.

Answer ([Please click here to Add Answer](#))

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What do you mean by polynomial time algorithm? Explain what kind of problem can be solved by using polynomial time algorithm?

Answer ([Please click here to Add Answer](#))

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You are given the task of laying down new railway lines which will connect all n cities. Thus for any pair of cities, you will end up with track connecting them. Note that two routes may share the same track; track laid between Lahore and Islamabad can be used to travel in both directions. Your goal is to use the minimum amount of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloyed Warshal Algorithm

Answer ([Please click here to Add Answer](#))

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Considering the recursive version of depth-first traversal implementing Timestamp Structure in pseudo code format, only write DFSVISIT routine in pseudo code format

Answer ([Please click here to Add Answer](#))

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Considering the recursive version of depth-first traversal implementing Timestamp Structure in pseudo code format, only write DFSVISIT routine in pseudo code format

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```
i=1
while (i < n) {
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}
for ( i=1;i <= n ;i=i*2 )
```

Answer ([Please click here to Add Answer](#))

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```
i=1
while (i < n) {
    i++
}
for ( i=1;i <= n ;i=i*2 )
for ( j = 1; j <= i; ++j )
```

Answer ([Please click here to Add Answer](#))

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Write pseudo code for Kruskal's algorithm.

Answer ([Please click here to Add Answer](#))

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track; track laid between Lahore and Islamabad can be used to travel in both directions. Your goal is to use the minimum amount of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloyed Warshal Algorithm
- 4 Bellman Ford Algorithm.

Answer ([Please click here to Add Answer](#))

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What is heap and heap order?

Answer ([Please click here to Add Answer](#))

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Define free tree.

Answer ([Please click here to Add Answer](#))

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A free tree is a tree with no vertex designated as the root vertex. A free tree with n vertices has exactly $n - 1$ edges. There exists a unique path between any two vertices of a free tree. Adding any edge to a free tree creates a unique cycle. Breaking any edge on this cycle restores the free tree.

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The following adjacency matrix represents a graph that consists of four vertices labeled 0, 1, 2 and 3. The entries in the matrix indicate edge weights.

	0	1	2	3
0	0	1	0	3
1	2	0	4	0
2	0	1	0	1
3	2	0	0	0

Answer the following question:

Answer ([Please click here to Add Answer](#))

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A rich text editor toolbar with various icons for file operations (save, print, search), editing (undo, redo, bold, italic, underline), and text alignment (left, center, right, justified). It also includes a font dropdown menu showing 'Normal', 'Arial', and '12', and a zoom dropdown menu showing '100%'.

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	0	1	2	3
0	0	1	0	3
1	2	0	4	0
2	0	1	0	1
3	2	0	0	0

Answer the following question:

Can an adjacency matrix for a directed graph ever *not* be square in shape? Why or why not?

Answer ([Please click here to Add Answer](#))

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A rich text editor toolbar with various icons for file operations (save, print, search), editing (undo, redo, bold, italic, underline), and formatting (bullet points, numbered lists, indent). It also includes a font dropdown menu showing 'Normal', 'Arial', and '12', and a zoom level dropdown set to '100%'.

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Where clique cover problem arises?

Answer ([Please click here to Add Answer](#))

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The clique cover problem arises in applications of clustering. We put an edge between two nodes if they are similar enough to be clustered in the same group. We want to know whether it is possible to cluster all the vertices into k groups.

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Consider a digraph $G = (V, E)$ and any DFS forest for G . Prove that G has a cycle if and only if the DFS forest has a back edge.

Answer ([Please click here to Add Answer](#))

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Describe three asymptotic notations.

Answer ([Please click here to Add Answer](#))

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Briefly discuss at least three variants of the shortest path problem.

Answer ([Please click here to Add Answer](#))

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What do you mean by polynomial time algorithm? Explain what kind of problem can be solved by using polynomial time algorithm?

Answer ([Please click here to Add Answer](#))

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Suppose you could reduce an NP-complete problem to a polynomial time problem in polynomial time. What would be the consequence?

Answer ([Please click here to Add Answer](#))

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According to Dijkstra's Algorithm, write the pseudo code to relax a vertex.

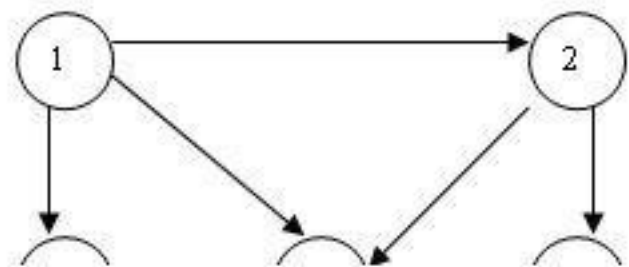
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Find the adjacent list for the following graph

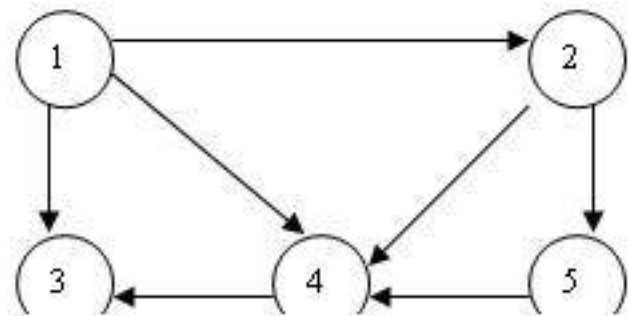


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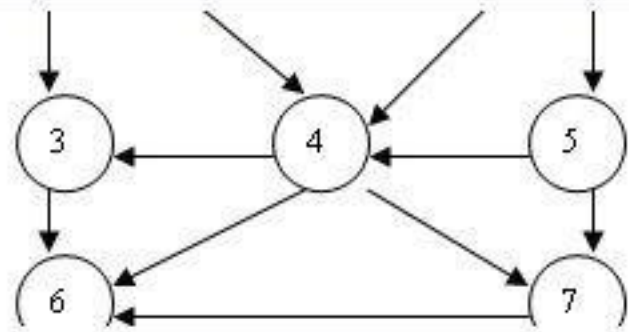


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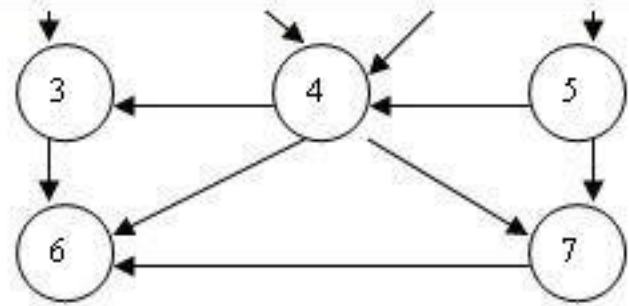


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Answer ([Please click here to Add Answer](#))

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Draw the final **Max-Heap** structure for the following array.

50, 31, 45, 30, 2, 7, 40, 12, 28, 1

You can show the final result (tree) only.

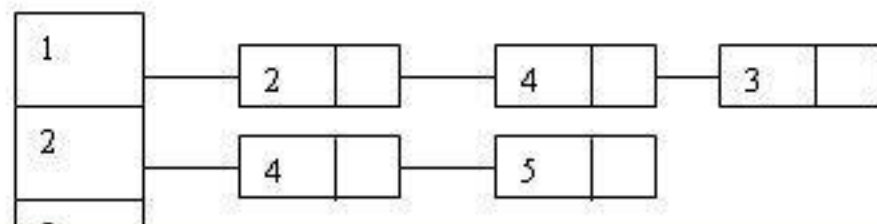
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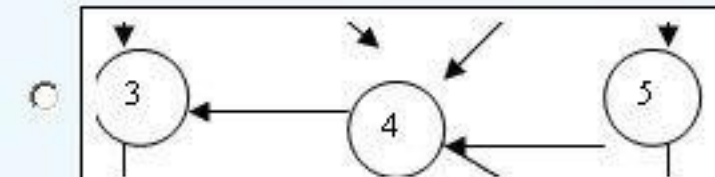
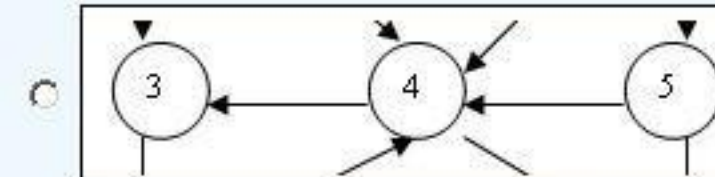
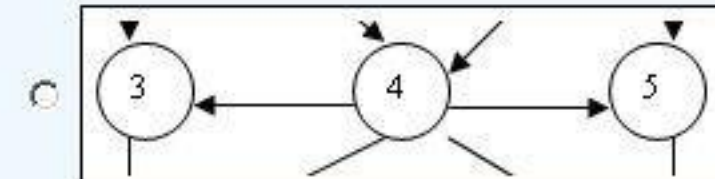
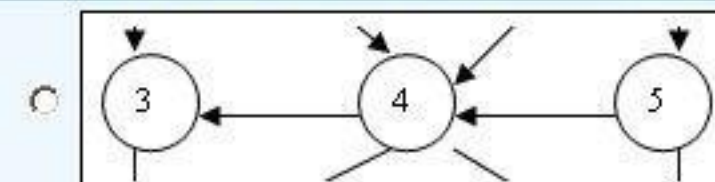
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Consider the following adjacency list:



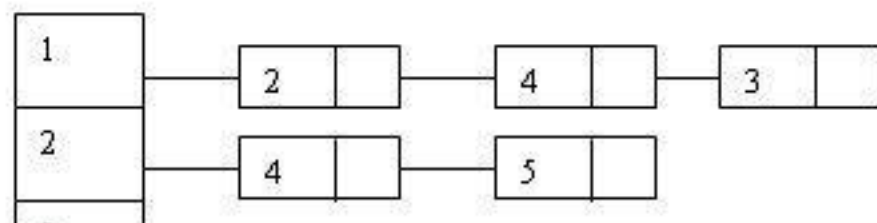
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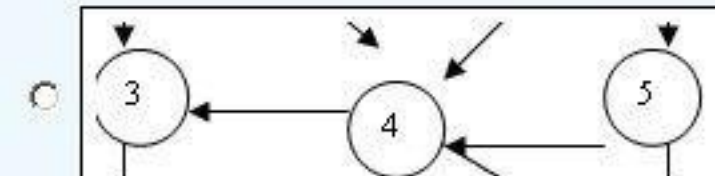
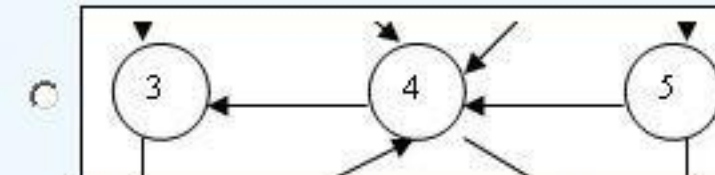
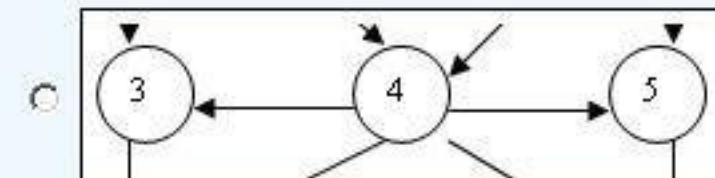
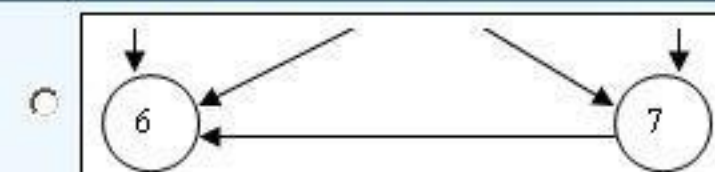
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Consider the following adjacency list:



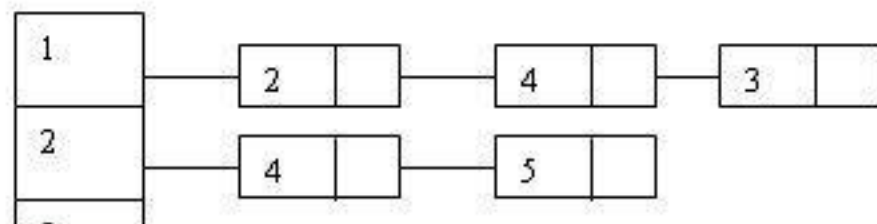
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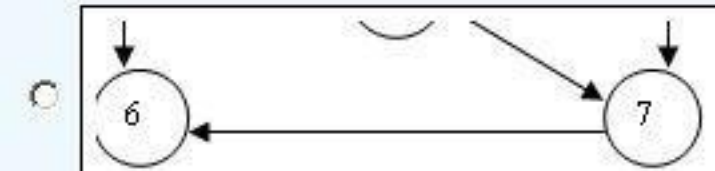
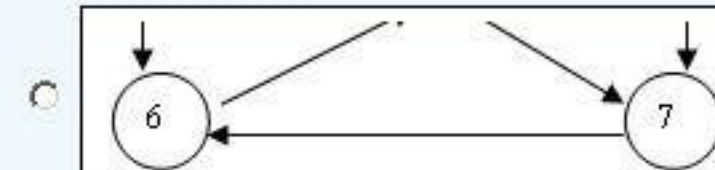
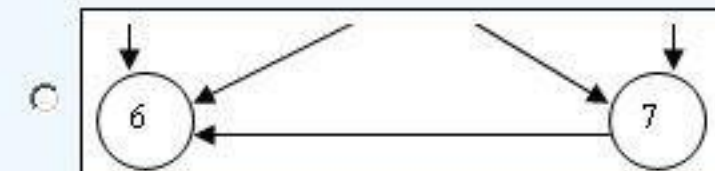
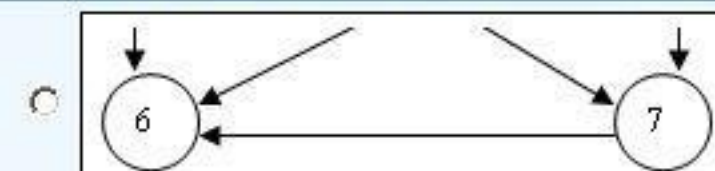
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Consider the following adjacency list:



Answer (Please select your correct option)

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In strong components problem what complete refers to?

Answer ([Please click here to Add Answer](#))

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What are quadratic series?

Answer ([Please click here to Add Answer](#))

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What is overall time for Kruskal's algorithm if the graph is sparse?

Answer ([Please click here to Add Answer](#))

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When a problem is called a decision problem?

Answer ([Please click here to Add Answer](#))

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Formally describe Minimum Spanning Trees Problem.

Answer ([Please click here to Add Answer](#))

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True or false: A sequence of values in a column of the dynamic programming table for an instance of the knapsack problem is always non-decreasing? Give a brief description.

Answer ([Please click here to Add Answer](#))

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Describe the relation between mutually reachable, equivalence relation, and component digraph.

Answer ([Please click here to Add Answer](#))

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You are given the task of laying down new railway line between Peshawar and Karachi. There are n intermediate cities that can be used and you know the cost of laying track between any pair of these cities. Your goal is to spend the least total amount of track to construct the railway line. How would you determine the least amount of track and the cities to go through? Name the best algorithm which addresses the above problem.

Answer ([Please click here to Add Answer](#))

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You are given the task of laying down new railway lines which will connect all n cities. Thus for any pair of cities, you will end up with track connecting them. Note that two routes may share the same track; track laid between Lahore and Islamabad can be used to travel in both directions. Your goal is to use the minimum amount of track. How would you achieve the goal now? (Note : consider the scenario carefully and name only the best suited algorithm)

- 1 Dijkstra's algorithm
- 2 Prims Algorithm
- 3 Folloyed Warshal Algorithm

Answer ([Please click here to Add Answer](#))

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Following is not the minimum spanning tree convert it into MST. [You can show final result in exam software and need not to show all intermediate steps].



Answer (Please [click here](#) to Add Answer)

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- 1 Dijkstra's algorithm
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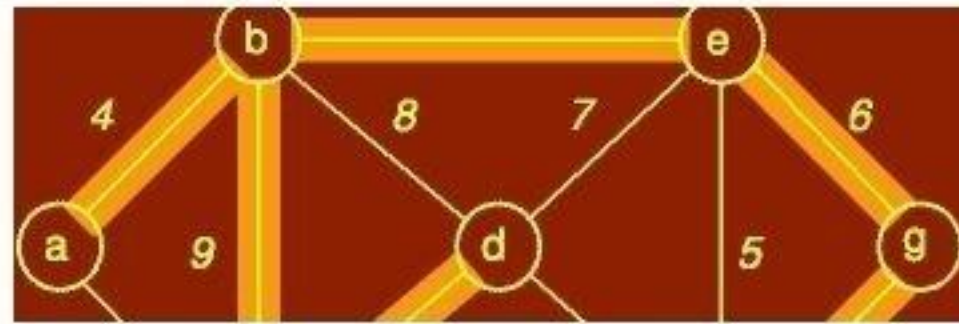


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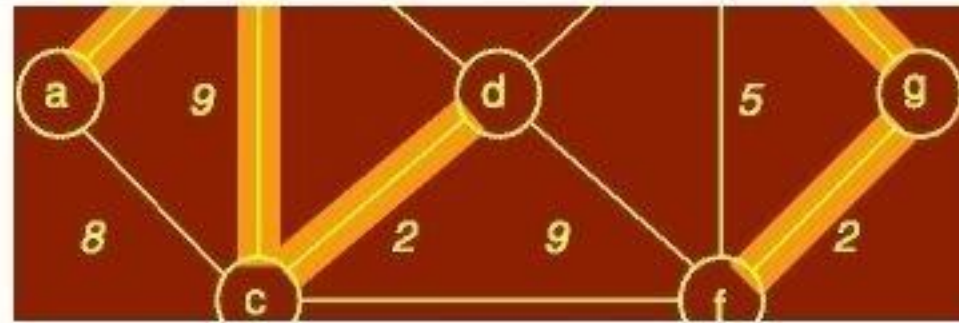


Answer (Please [click here](#) to Add Answer)

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Answer (Please [click here](#) to Add Answer)

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Answer (Please [click here](#) to Add Answer)

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Consider the following recursive search function which returns the index of the array element containing key, if such an element exists. Find out what is the complexity of search and show your work.

```
int search( int* array, int left, int right, int key){
    int mid = (left + right)/2;
    if( left == right )
        return left;
```

Answer ([Please click here to Add Answer](#))

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```
return left;
else if( array[mid] <= key )
return search( array, mid+1, right, key );
else
return search( array, left, mid, key );
}
```

Answer ([Please click here to Add Answer](#))

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Write pseudo code for the algorithm, if we implement the bag of knapsack by using a stack.

Answer ([Please click here to Add Answer](#))

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