✓ Which one of the following is not characteristic features of an algorithm 1/1

- Finiteness
- Effectiveness
- Definiteness
- **Computitiveness** ✓

✓ Each instruction of the algorithm should be clear and unambiguous. This characteristic feature of algorithm is called 1/1

- **Definiteness** ✓
- Effectiveness
- Efficiency
- Finiteness

✗ Which one of the following is not a method of algorithm correctness? 0/1

- Counter-examples
- **Loop invariants** ✗
- Maintenance
- Induction method

Correct answer

- **Maintenance**

✓ How many comparisons are possible for input size = 10 in insertion sort for the best, and worst cases 1/1

- **9, 45** ✓
- 45, 9
- 9, 100
- 20, 55

✓ How many comparisons are possible for bubble sort for input size n 1/1

- **n(n-1)/2** ✓
- n^2
- $(n^2)-n)/2$
- $n^2/2$

✗ What is the time complexity of Build Heap operation. Build Heap is used to build a master min/ binary heap from a given array. Build Heap is used in Heap Sort as a first step for sorting. 0/1

- O(n^2)
- O(nLogn) ✗
- **O(Logn)**
- O(n)

Correct answer

- O(n)

✓ Consider a binary max-heap implemented using an array. Which one of the following array represents a binary max-heap? 1/1

- 25,12,16,13,10,8,14
- **25,14,16,13,10,8,12** ✓
- 25,14,12,13,10,8,16
- 25,14,12,13,10,8,28

✓ Consider a max heap, represented by the array: 40, 30, 20, 10, 15, 16, 17, 8, 4. Now consider that a value 18 is inserted into this heap. After insertion, the new heap is 1/1

- 40, 30, 20, 10, 18, 15, 16, 17, 8, 4, 35
- **40, 35, 20, 10, 30, 15, 16, 17, 8, 4, 15** ✓
- 40, 35, 20, 10, 20, 15, 16, 17, 8, 4, 15
- 40, 35, 20, 10, 15, 16, 17, 8, 4, 38

Consider the following graph

✓ The number of distinct minimum spanning trees for the weighted graph below is 1/1

- 4
- 5
- **6** ✓
- 7

✓ The best data structure to check whether an arithmetic expression has balanced parentheses is a 1/1

- **Stack** ✓
- Queue
- tree
- list

Suppose we run Dijkstra's single source shortest-path algorithm on the following edge-weighted directed graph with vertex P as the source.

In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized? 1/1

- P, Q, R, S, T, U
- **P, Q, R, U, S, T** ✓
- P, Q, R, U, T, S
- P, Q, T, R, U, S

✓ A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency: character Frequency a 6 b 9 c 12 d 13 e 16 f 45 Note : Each character in input message takes 1 byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message? 1/1

- 224
- 800
- **576** ✓
- 324

✓ Suppose the letters a, b, c, d, e, f 1/1 have probabilities 1/2, 1/4, 1/8, 1/16, 1/32, 1/32 respectively. Which of the following is the Huffman code for the letter a, b, c, d, e, f?

- **0, 10, 110, 1110, 11110, 11111** ✓
- 11, 10, 011, 010, 001, 000
- 11, 10, 01, 001, 0001, 0000
- 110, 100, 010, 000, 001, 111

- Option 1

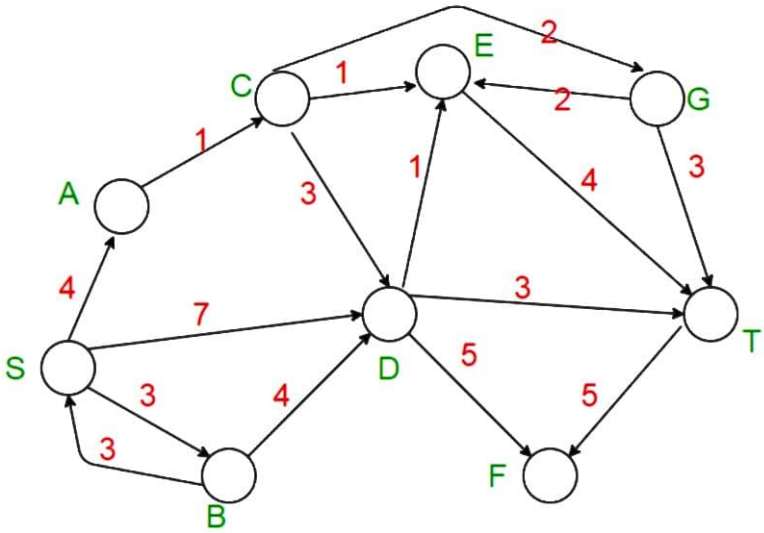
Consider the undirected graph below:

✓ Using Prim's algorithm to construct a minimum spanning tree starting with node A, which one of the following sequences of edges represents a possible order in which the edges would be added to construct the minimum spanning tree? 1/1

- (E, G), (F, F), (F, G), (A, D), (A, B), (A, C)
- (A, D), (A, B), (A, C), (C, F), (G, E), (F, G)
- (A, B), (A, D), (D, F), (F, G), (G, E), (F, C)
- **(A, D), (A, B), (D, F), (F, G), (F, C), (G, E)** ✓

- Four matrices M1, M2, M3 and M4 of dimensions pxq, qxr, rxs and sxt respectively can be multiplied in several ways with different number of total scalar multiplications. For example, when multiplied as ((M1 X M2) X (M3 X M4)), the total number of multiplications is pqr + rst + prt. When multiplied as (((M1 X M2) X M3) X M4), the total number of scalar multiplications is pqr + prs + pst.If p = 10, q = 100, r = 20, s = 5 and t = 80, then the number of scalar multiplications needed is

Consider the given graph.



Consider the directed graph shown in the figure. There are multiple shortest paths between vertices S and T. Which one will be reported by Dijstras shortest path algorithm? Assume that, in any iteration, the shortest path to a vertex v is updated only when a strictly shorter path to v is discovered. 1 point

- SDT
- SBDT
- SACDT
- SACET

(E, G), (C, F), (E, G), (A, D), (A, B), (A, C)

(A, D), (A, B), (A, C), (C, F), (G, E), (F, C)

(A, B), (A, D), (B, F), (F, C), (G, E), (F, C)

(A, D), (A, B), (B, F), (F, C), (F, E), (G, E) ✓

✓ Four matrices M1, M2, M3 and M4 1/1
of dimensions pxq, qxr, rxs and
sxt respectively can be multiplied
is several ways with different
number of total scalar
multiplications. For example,
when multiplied as ((M1 X M2) X
(M3 X M4)), the total number of
multiplications is pqr + rst + prt.
When multiplied as (((M1 X M2) X
M3) X M4), the total number of
multiplications is pqr + prs
+ prt.If p = 10, q = 100, r = 20, s =
5 and t = 80, then the number of
scalar multiplications needed is

248000

44000

19000 ✓

25000

✓ Let A1, A2, A3, and A4 be four 1/1
matrices of dimensions 10 x 5, 5 x
20, 20 x 10, and 10 x 5,
respectively. The minimum
number of scalar multiplications
required to find the product
A1A2A3A4 using the basic matrix
multiplication method is

1500 ✓

2000

500

100

✗ Which of the following standard 0/1
algorithms is not a Greedy
algorithm?

Dijkstra's shortest path algorithm

Prim's algorithm ✗

Huffman Coding

Bellman Ford Shortest path algorithm

Correct answer

Bellman Ford Shortest path algorithm

✓ What is the time complexity of 1/1
Huffman Coding?

(A) O(N)

(B) O(NlogN) ✓

(C) O(NloglogN^2)

(D) O(N^2)

✗ Consider 6 characters with their 0/1
frequencies as follows, a = 42, b =
20, c = 5, d = 10, e = 11, f = 12.
What will be the sequence of
characters corresponding to the
code = 10001011101110111010101?

eafdbcafa

eafdcbfef

eafdcbafa

eafdbcfef

✓ The computational complexity of 1/1
solving Fibonacci series for N
terms using Dynamic
programming is

O(2^N)

O(N) ✓

O(N^2)

O(N^3)

✓ What is the time complexity of 1/1
the recursive implementation
used to find the nth fibonacci
term?

O(1)

O(n2)

O(n!)

Exponential ✓

✓ Which of the following is the 1/1
recurrence relation for the matrix
chain multiplication problem
where mat[i-1] * mat[i] gives the
dimension of the ith matrix?

dp[i,j] = 1 if i=j, dp[i,j] = min(dp[i,k] +
dp[k+1,j]

dp[i,j] = 0 if i=j, dp[i,j] = min(dp[i,k] +
dp[k+1,j]

dp[i,j] = 1 if i=j, dp[i,j] = min(dp[i,k] +
dp[k+1,j] + mat[i-1]*mat[k]*mat[j]

dp[i,j] = 0 if i=j, dp[i,j] = min(dp[i,k] +
dp[k+1,j] + mat[i-1]*mat[k]*mat[j] ✓

✓ Consider the strings 1/1
"PQRSTPQRS" and
"PRATPBQRPS". What is the
length of the longest common
subsequence?

9

8

7 ✓

6

✓ Consider the strings "monday" 1/1
and "tuesday". What is the edit
distance between the two
strings?

3

4 ✓

5

6

✓ Consider the two strings: 1/1
("empty string) and "abcd" .
What is the edit distance
between the two strings?

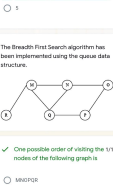
3

0

4 ✓

5

The Breadth First Search algorithm has
been implemented using the queue data
structure.



✓ One possible order of visiting the 1/1
nodes of the following graph is

MNOPQR

NQMPOR

QMNPRO ✓

QMNPQR

Consider the DAG with Consider V = {1, 2,
3, 4, 5, 6}, shown below.

✓ Which of the following is NOT a 1/1
topological ordering?

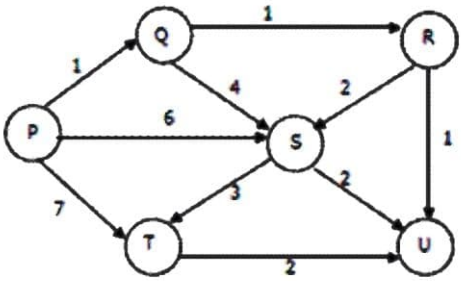
1 2 3 4 5 6

1 3 2 4 5 6

1 3 2 4 6 5

3 2 4 1 6 5 ✓

Suppose we run Dijkstra's single source shortest-path algorithm on the following edge weighted directed graph with vertex P as the source.



In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized? 1 point

- P, Q, R, S, T, U
- P, Q, R, U, S, T
- P, Q, R, U, T, S
- P, Q, T, R, U, S

A networking company uses a compression technique to encode the message before transmitting 1 point