Branch : CSE & IT Batch : English

Algorithms

'Dynamic Programming' & 'Graph Algorithm' DPP

[MCQ]

1. What is the time complexity of dynamic programming for matrix chain multiplication problem?

(a) $O(n^2)$
(b) $O(n^3)$
(c) O(nlogn)
(d) None of these

[NAT]

2. Consider the matrices x, y and z with dimension 10 × 20, 20 × 30 respectively. Then what is the minimum number of multiplications required to multiply the matrices? _____

[MCQ]

3. What is the length of the LCS for the pair of subsequences given below.

P = ATGACTATAA
Q = GACTAATA

(a) 5 (b) 6
(c) 7 (d) 8

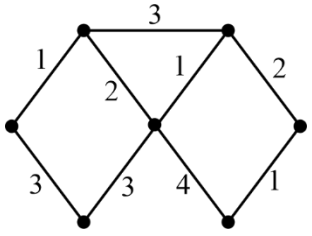
[MCQ]

4. Consider a connected weighted graph G = (V, E), where |V| = n, |E| = m, if all the edges have distinct positive integer weights, then the maximum number of minimum weight spanning trees in the graph is ?

(a) n (b) m
(c) 1 (d) n^{n-2}

[MCQ]

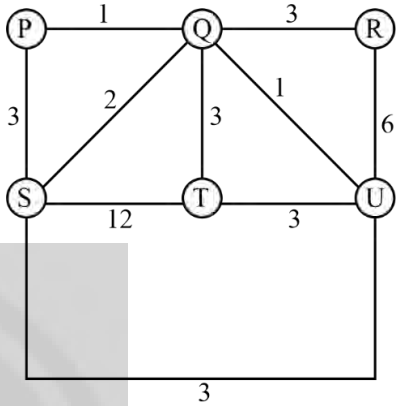
5. What is the weight of the minimum spanning tree for the graph shown below?



(a) 7 (b) 8
(c) 9 (d) 10

[MCQ]

6. How many minimum spanning tree does this graph have?



(a) 2 (b) 3
(c) 4 (d) 5

[MCQ]

7. Consider the following problem with knapsack capacity of 8

Items	Profits	Weights
I_1	13	1
I_2	8	5
I_3	7	3
I_4	3	4

Which of the following item is not selected in the optimal solution of 0/1, knapsack problem?

(a) I_1 only (b) I_2 only
(c) I_3 only (d) I_4 only

[MCQ]

8. Consider the following statements

S1: for every weighted graph and any two vertices p and q, Bellman ford algorithm starting at p will always return a shortest path to q.

S2: At the termination of Bellman ford algorithm even if graph has negative weight cycle, correct shortest path is found for vertex for which shortest path is well-defined.

Which of the statement is correct?

(a) only S1
(b) only S2
(c) Both S1 and S2 are true
(d) neither S1 nor S2 is true

Answer Key

1. **(b)**
2. **(18000 to 18000)**
3. **(c)**
4. **(c)**
5. **(d)**
6. **(a)**
7. **(b)**
8. **(d)**

Hints & Solutions

1. (b)

Time complexity of the dynamic programming approach is $O(n^3)$. Where n is the number of matrices. Because it contains nested loop iterating over the matrix dimension to fill in the optimal costs.

2. (18000 to 18000)

Given matrix dimension

x : 10 × 20

y : 20 × 30

z : 30 × 40

Optimal parentification is ((xy)z)

Minimum number of multiplications

= 10 × 20 × 30 + 10 × 30 × 40 = 18000

3. (c)

P=A T G A C T A T A A

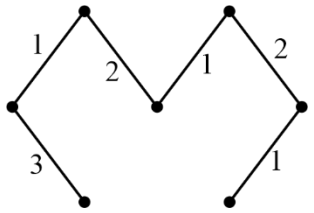
G A C T A A T A

G A C T A A A

4. (c)

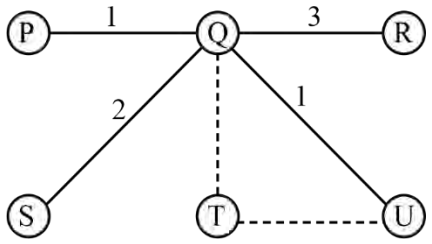
The maximum number of minimum weight spanning tree in a connected weighted graph G(V, E) with |V| = n and |E| = m, where all edges have distinct positive integer weight is 1.

5. (d)



1 + 2 + 1 + 2 + 3 + 1 = 10

6. (a)



There are 2 dotted lines are the only choices that it has,

∴ Hence are only 2 MST possible here.

7. (b)

w = 8(capacity)

Feasible solution

(i) $\{I_1, I_3, I_4\}$

Profit = 13 + 7 +3 = 23

(ii) $\{I_2, I_3\}$

Profit = 8 + 7 = 15

Optimal solution = $\{I_1, I_3, I_4\}$

With the capacity of 8 and maximum profit produced is 23.

I_2 is not selected in the solution.

∴ (b) is correct option.

8. (d)

Bellman ford algorithm may not return a shortest path from p to q

∴ S_1 is false

If graph has negative weight cycle, then Bellman ford given error, so 2nd statement is also false.