# Branch : CSE & IT  Batch : Hinglish

# 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

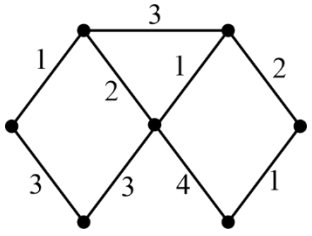
**[MCQ]**

**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]**

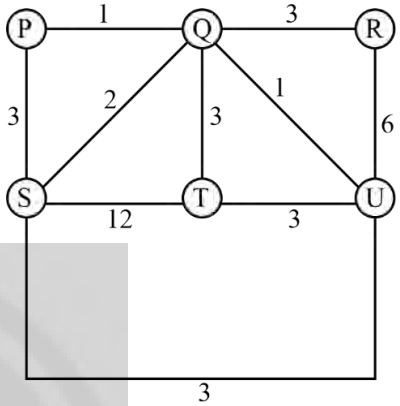
**5.** What is the weight of the minimum spanning tree for the graph shown below?




(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

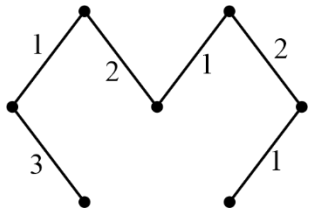
G A C T A A T A

G A C T A A A

**4. (c)**

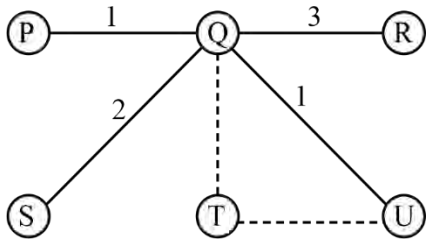
The maximum number of minimum weight spanning tree in a connected weighted graph G(V, E) with |V| = n and |E| = m, where all edges have distinct positive integer weight is 1.

**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.