BRAC University (Department of Computer Science and Engineering)
CSE 221 (Algorithms) for Summer 2025 Semester
(NO EXTRA PAGE IS ALLOWED)
Quiz 4

Student ID: **Full Marks: 20**
Section: 11 **Duration: 30 minutes**
Name:

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1. A thief has a knapsack with a maximum weight capacity of 7 units. There are 6 items, each with a given weight and profit:

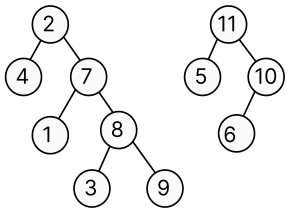
Item No.	1	2	3	4	5	6
Weight	1	3	4	5	2	3
Profit	1	4	5	7	3	6

Using Dynamic Programming, determine the maximum profit the thief can obtain without exceeding the knapsack's capacity (W = 7). **(10 Marks)**

2. Suppose we are solving the 0/1 Knapsack Problem using Dynamic Programming. We need to compute the value of cell M[i, wt], where: ***`i` = index of item and `wt` = current capacity***. Write down the formula for M[i, wt]. **(3 marks)**

3. Given a DSU with the following tree and parent array: ***(Without using Path Compression)***
    - What is the output of ***find(3)***? Show the steps **(3 Marks)**
    - After ***union(3, 6)*** show the **updated parent array** and the **tree (2+2 Marks)**

Node	1	2	3	4	5	6	7	8	9	10	11
Parent	7	2	8	2	11	10	2	7	8	11	11



Bonus (5 marks): Show the **tree** and **array** after calling the function ***find(3) with Path Compression***.