

Assignment 2

- Due Date: **10:00AM, 10 Mar (Mon), 2021.**
- Please submit one solution sheet per group.
- Please mention the names and roll numbers of all the group members on the first page of the answer sheet.
- Discuss only with your fellow group members.
- In case you use external sources for deriving your solutions, please specify them clearly.
- We will be able to cross-check your understanding of the solutions in the viva. For this it is important to know and understand every solution you write in your submission.

1. Given an n -digit number a , give an algorithm to compute a^2 that runs in time $n^{\log_3 6}$. Give the correctness of your algorithm and a detailed justification for its time complexity.
2. Solve problem # 34 on page # 62 from Jeff Erickson's book.
3. Suppose you are given rectangular tiles with height 1 and width 2. You have to use these to tile a rectangle of height 3 and width $2n$. Describe an $O(n)$ time algorithm to find the number of ways in which this can be done. Note that tiling a rectangle means covering it by tiles whose interiors are disjoint. A tile may be placed vertically or horizontally. Do the same for rectangles of height 4 and width n .
4. Suppose you are given an undirected tree with arbitrary (positive or negative) weights assigned to the edges. Describe an $O(n)$ time algorithm to find a subtree of the tree having maximum total weight. Modify the algorithm in the case the subtree is required to be a path.
5. Given a sequence of distinct numbers a_1, a_2, \dots, a_n with arbitrary weights w_1, \dots, w_n assigned to them, design algorithms to find
 - (a) A maximum weight increasing subsequence.
 - (b) A maximum weight subsequence such that no three consecutive numbers in the original sequence belong to the subsequence.

