

ECSE210L: Design and Analysis of Algorithms**Tutorial 5 (Week 5: February, 03 - 07, 2020)***Instructors: Shakti Sharma and Raghunath Reddy M*

- (Q1) Consider the 0/1-Knapsack problem. You are given a set of items I_1, I_2, \dots, I_n . Each item I_j has a size s_j and profit p_j associated with it. Further, you are given a sack of size B . Your job is to pick a sub-set of items whose total size is at most B such that the profit obtained by the items is maximum. You are not allowed to pick a fraction of the item as in the case of fractional Knapsack problem.

Apply the greedy algorithm of fractional Knapsack problem to 0/1-Knapsack problem and check the solution is optimal or not.

- (Q2) **Frog Jumping problem:** Let $0, 1, 2, \dots, n$ be the series of positions in a river. Lilypads are placed at some positions, and there is always a lilypad at position 0 and position n . The frog is now at position 0, and it wants to reach to position n by jumping from one position to another position. Note that if the frog jumps into a position without lilypad, the frog dies. So, the goal is to find the minimum size path of positions with lilypads, so that if the frog follows the path, it will reach position n . Further, the frog can jump at most r positions at a time. Design an algorithm to help the frog and prove its correctness.