Mid Semester Examination
Algorithms and Operating Systems

23rd Sept, 2025

PART A: Do **any two** in PART A [10X2 marks}

Q1. You have decided to drive from Kanyakumari to Srinagar and would need to plan which hotels to stay at along the way. You are to consider the following assumptions:
1. Single highway from Kanyakumari to Srinagar which is exactly N kms long.
2. There is one hotel every 1 km on the way.
3. You can drive **at most** P kms per day and stop for a hotel.
4. You are provided the cost of all the hotels that are located every 1km on this route.

You want to find the minimum possible total amount of money that you can spend on hotels during your trip.
Provide an optimal algorithm for the above. Provide the complexity of the algorithm if
a. You only need to report the minimum possible amount of money
b. You need to also report the index of the hotels you need to stay at.

Input:
N (total distance to travel)
P (at most distance you can travel a day)
Array A of size N-1 where A[I] is the cost per night of the hotel located at distance I km from the start point.

Q2. There are n boxes arranged in a row. From left to right, the lengths of the boxes are `l1, l2 ,.. . . , ln. You need to transport these boxes by a truck. The truck can only take a set of boxes whose total length is at most L. You want to transport these boxes with minimum number of trips by the truck.

Provide a greedy algorithm with complexity and also prove that greedy is optimal for this problem
Input: length of each box and truck length L.

Q3. Given an array, we say that two array elements arr[i] and arr[j] form an inversion if arr[i] > arr[j] and i < j.
Find the inversion count in the array using divide and conquer.
Hint: Use merge sort where you count the inversions as you merge the array.
Provide the pseudocode/code and complexity as to how you will achieve this.