
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
CS21003 Algorithms I: First Class Test 2021 Spring

Date of Examination: 30th January 2021

Duration: 30 minutes + 5 minutes (for scanning, concatenating, and uploading)

Full Marks: 10

Subject: CS21003 Algorithms I

Part I

1. A Set distinct integers is available in k 'peak'-type disjoint lists, L_1 to L_k . Each L_i has a sequence of increasing elements followed by decreasing elements, with a peak. The peak can be anywhere in the list except at the beginning or end of the list. Each list can be of any size, but will have at least 3 elements. The objective is to find the top 3 elements of the full set of numbers comprising all the lists. For this, you will do the following
 - (a) Present a brief outline explaining your overall approach to solve the problem.
 - (b) Develop and present a properly designed recursive definition and present the same highlighting the base conditions, decomposition, recursive calls and re-composition functions for every recursive function.
 - (c) Show its working on an example with $k = 3$ and L_1, L_2 and L_3 having 5, 6 and 7 elements, respectively.
 - (d) Analyze the worst case time complexity of your algorithm.
 - (e) Propose a final algorithm with refinement and Data Structures. Show its working on the same example.
 - (f) Present the worst case time complexity of your final algorithm.

[1 + 3 + 1 + 1 + (2+1) + 1 = 10 marks]

All the best
