Assignment 4: CS21003 Algorithms 1

Prof. Partha Pratim Chakrabarti and Palash Dey
Indian Institute of Technology, Kharagpur

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1. You are given a "black box" access to a function which computes a median of an array of integers. The prototype of the function is the following.

   int findMedian(int a[], int sizeOfArray);

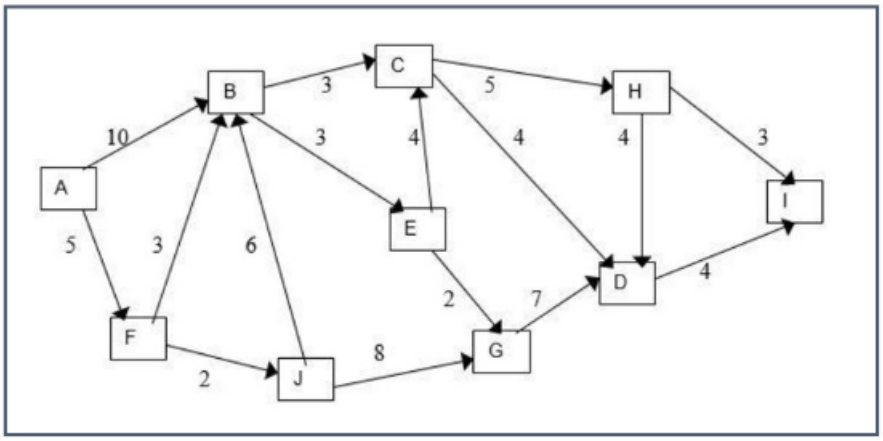
   Write a function which finds the i-th smallest integer of an array for any input i using the above findMedian function. Do not write a function for finding the i-th smallest integer of an array from scratch. Clearly (i) explain your algorithm in plain English, (ii) write pseudocode of your algorithm, and (iii) analyze time and space complexity of your algorithm.

   [3+3+4 Marks]

2. Present an algorithm to find the cost of the k**-th shortest path in a weighted directed acyclic graph**. (Path costs need not be distinct. For example, if the order of path costs is 5, 6, 7, 7, 8, 8, 9, then the cost of the 5-th shortest path is 8.) You may assume that there are more than k paths from start to goal which differ by at least one edge.

   Show step by step working of your algorithm on the example given below where node A is the start and node I is the goal for the case of $k = 5$.

   Analyze the time and space complexity of your proposed algorithm.



[5+2+3 Marks]