

01OGD Algorithms and Programming

04/02/2017 – Part I: Theory (12 points)

1. (2.5 points)

Insert in sequence the following integer data in an initially empty priority queue:

10 15 5 18 4 23 9 16

Use a heap for the priority queue (maximum priority in root) At the end first extract the maximum and then change the priority of 4 to 20.

2. (2 points)

Using a greedy algorithm find an optimal Huffman code for the following symbols with specified frequencies:

A: 24 B: 12 C: 10 D: 8 E: 6

M: 19 O: 14 Q: 3 T: 11 U: 7

3. (2 points)

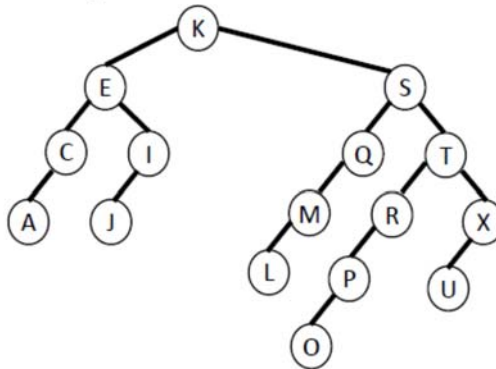
Given the sequence of integers

11 144 267 312 98 100 45 207 13 99 181

draw the final configuration of an initially empty hash table of size 23 where insertion of the previous sequence occurs. Assume open addressing with double hashing ($h_1(k) = k \% 23$, $h_2(k) = 1 + k \% 97$). Define suitable hash functions. Show relevant intermediate steps.

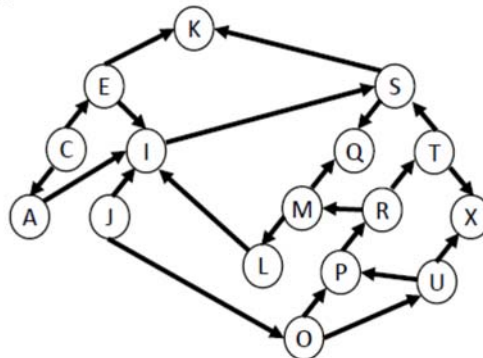
4. (2 points)

Partition the following BST around key M:



5. (2 +1.5 points)

Given the following directed graph:



- visit it in depth-first starting from node S (2 points)
- redraw it, labelling each edge as T (tree), B (back), F (forward), C (cross). Start from node S (1.5 points).

If necessary, consider nodes in alphabetical order.