Tutorial 13

Q 1 Does this array represent a Max-Heap with the root at index 1? (Ignore the data at index 0.)



1. Draw the heap like a tree.
2. Is this a valid heap? Briefly justify your answer.

Q 2. On an initially empty binomial heap, carry out the following sequence of operations: insert(27), insert(17), insert(19), insert(20), insert(24), insert(12), insert(11), insert(10), insert(14), insert(18), deletemin, decreasekey (19, 7), delete (17), decreasekey (24,5), deletemin. After each operation, draw the resulting structure of the binomial heap.

Q 3 On an initially empty Fibonacci heap, carry out the following sequence of operations: insert(27), insert(17), insert(19), insert(20), insert(24), insert(12), insert(11), insert(10),insert(14), insert(18), deletemin, decreasekey(19, 7), delete (17), decrease-key(24,5),deletemin.

Q 4 Consider the following data structure:

We have a collection of arrays say A0; A1; A2; . ; ..

The size of the kth array is 2k.

Each array is either full or empty, and each individual array is sorted.

There are no relationships between elements of different arrays.

The binary representation of the total number of elements that we store in the data structure decides which arrays are empty or full.

For example, if we had 9 items, then A0; A3 are full and A1; A2 are empty.

1. What is the time complexity to extract the minimum element?
2. Can you suggest an improvement in the above operation?
3. How would you perform insertion in the above defined data structure such that the properties are preserved. What is the time complexity for the operation suggested by you?