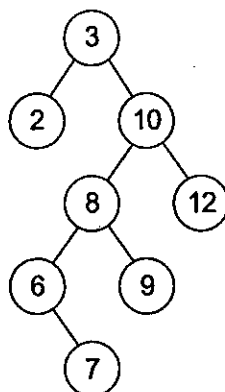


Please use C++ (or Java) for all programming questions.

1. (10 %) Write a short recursive function that will rearrange an array of int values so that all the even values appear before all the odd values.
2. (10 %) Write a method called `removeNode` in a singly-linked list called `SList`. The method takes an `SListNode` node and removes it. After completion, all the other nodes must still be in the list, in the same order as before.
3. (10 %) Describe (not code) a single algorithm for finding the k th smallest key in a binary search tree of n keys, where $1 \leq k \leq n$.
4. (15 %) Asymptotic analysis.
 - (a) (8 %) Which of the following functions grows faster: $n \log n$ or $n^{1+\alpha/\sqrt{\log n}}$ with $\alpha > 0$? Why?
 - (b) (7 %) Show that if $p(n)$ is a polynomial in n , then $\log p(n)$ is $O(\log n)$.
5. (15 %) Propose a data structure that supports the stack `push` and `pop` operations and a third operation `findMin`, which returns the smallest element in the data structure, all in $O(1)$ worst-case time.
6. (15 %) Weighted graph.
 - (a) (8 %) Draw a simple, connected, undirected, weighted graph with 8 vertices and 16 edges, each with unique edge weights.
 - (b) (7 %) Find the minimum spanning tree of the graph.
7. (15 %) Trace the in-place, array-based quicksort algorithm as it sorts the following letters into alphabetical order: E S O E E X A M
Always choose the last element of any subarray to be the pivot. Show the array after each swap.
8. (10 %) What does the following splay tree look like after `remove(5)`?



試題隨卷繳回