

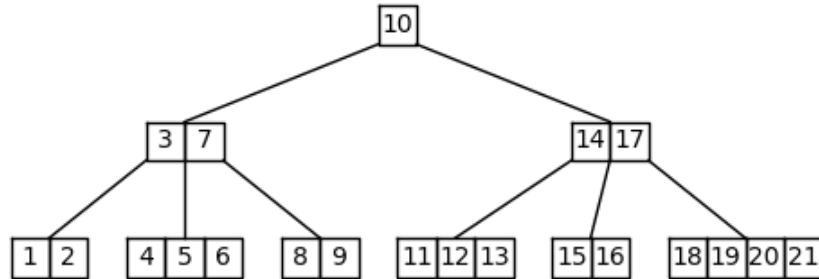
CS2302 - Data Structures

Spring 2020

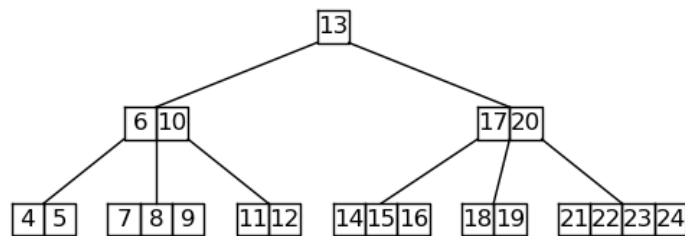
Exam # 2 - B-Trees

'In my life, I have met many good people who fail a Data Structures exam, however, I have never met a good person who cheats in a Data Structures exam' - Mahatma Gandhi

1. The function $find_depth(T, k)$ is supposed to receive a B-Tree T and an integer k and return the depth at which k is found in the tree, or -1 if k is not in the tree. For example, for the tree below, $find_depth(T, 5)$ should return 2 and $find_depth(T, 2302)$ should return -1. However, the function does not work correctly. Fix it so it produces the right results. Hint: the function has two errors. Note: your task is to correct these errors, not to replace the function by a completely different function.



2. Write the function $nodes_with_n_keys(T, n)$ that receives a B-Tree T and integer n and returns the number of nodes in the tree that have exactly n items. For example, for the tree above, $nodes_with_n_keys(T, 3)$ should return 2.
3. Write the function $add_n(T, n)$ that receives a B-Tree T and an integer n and add n to every data item in the tree. For example, $add_n(T, 3)$ should convert the tree from question 1 to the tree below:



4. Write the function $prune_leaves(T)$ that receives a B-Tree T and modifies T so that each leaf node in T contains only the two smallest data items in the original node. For example, if T is the tree from question 1, after executing $prune_leaves(T)$ T should be the tree below.

