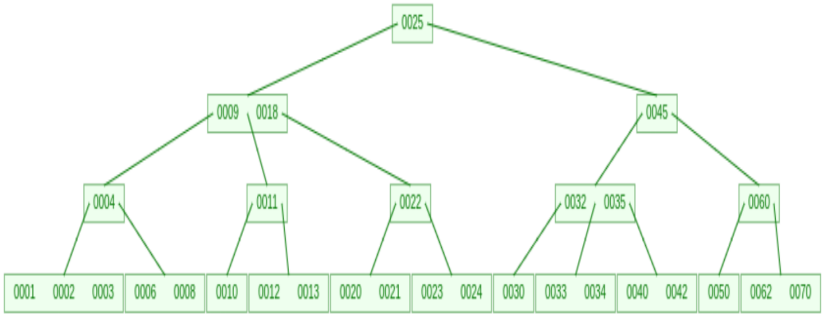
Instructions

- Upload (to google classroom) all answers in the same document, but in serial order.
- Name the file in the following format: RollNo.png (or jpeg).
- It is recommended to write your name and roll number in the answer sheet.

1. In the B-tree below (2-3-4 tree, to be precise), delete 18 and 60. Illustrate each step, stating which of the cases discussed in the class (as per CLRS, 1, 2(a)/(b)/(c) and 3(a)/(b)) applies at each step. (5 + 5 marks)



2. Recall that in the B-tree, every node other than the root must have at least $t-1$ keys, where the t is the minimum degree. Suppose this lower limit is increased to much higher–for example, from $t-1$ to $\frac{4(2t-1)}{5}$, where the size of the disk block is $2t-1$. What are the advantages and disadvantages if any? (5 marks)

3. Suppose you have a hash table of size $m = 11$. Randomly generate n keys (you can use a program to do so) such that the load factor is 1. Insert them using the following hash functions: $h(k) = k \mod 11$ (for chaining), and for open addressing: $h'(k, i) = (h(k) + i) \mod 11$ (for linear probing) and $h''(k) = (h(k) + i^2) \mod 11$ for quadratic probing. (5 marks)