

## CMSC 341 Homework 5 – Version B

### B Trees and Hashing

Name:

Section:

HW #:

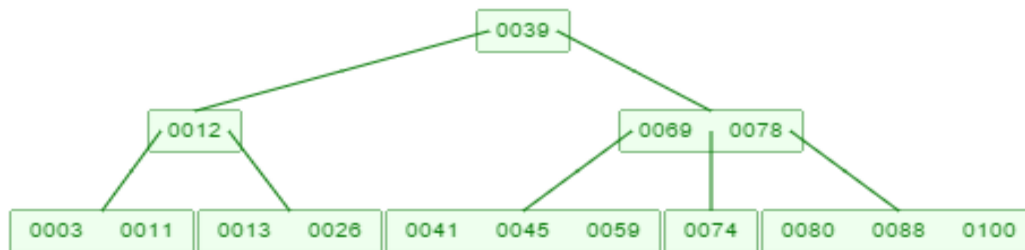
Version:

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1. Build a B-Tree key structure (keys only, no leaves) with the value below. Show step by step. Explain any promotions. The tree has an M value of 5.

44    30    3    80    66    51    5    67    95    14    22    82    2    40    98

2. Using the B-Tree below, and understanding that it's M value is 4, what would the tree look like after the 74 value was deleted. Explain and draw each step.



3. Suppose our B-Tree stores 13,371,337 voting records which contain name, address, etc. and other data totaling 1 MB. Further assume that the key to each record 4KB long, that a pointer requires 4 KB and our disk block is 1 GB. Finally, the first 2 levels of the B-Tree are stored in memory and everything else is on a secondary storage device.
  - (a) What are the values of M and L in this case?
  - (b) What is the number of leaf nodes in the best and worst cases?
  - (c) What is the height of the B-Tree in the worst case?
  - (d) What is the number of disk access needed to get any information?
4. Why don't we allow a minimum degree of  $t = 1$ ?
5. Complete the insertion of values into a Hash table with a K (or N) of 29. While inserting values, track how many probes it takes for completion. You will be using the data below for two types of hashing, linear and quadratic. For the sake of consistency, a "probe" is each time a table element is checked to see if open or not. There could be a chance that towards the end, probes may be hard to determine since it may appear infinite. If that is the case, place "undetermined" as your answer.

46    91    51    26    64    89    12    98    41    31    62    36    49    39    95    75    20  
38    27    11    24    43    90    22    18    21    55    28    87

	# of Probes
Linear	
Quadratic	