

Indexing and Hashing – Practice Questions

1. B⁺-trees are often used as index structures for database files because they maintain their efficiency despite repeated insertion and deletion of data.
 - a) Show the structure of a B⁺-tree for a file containing records with the following search key values, assuming that the tree is initially empty, that three pointers fit in one node, and that records are added in the order given:

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- b) Now show the structure of the B⁺-tree from part a) after the insertion of a record with the search key value 'Yashin'.
 - c) Now show the structure of the B⁺-tree from part b) after the deletion of the record with the search key value 'Fleury'.
2. Suppose that extendable hashing is being used on a database file that contains records with the following search key values:

2, 3, 5, 7, 11, 17, 19, 23, 29, 31

- a) Construct the extendable hash structure for this file if the hash function is $h(x) = x \text{ mod } 7$ and each bucket can hold three records.

Decimal	Binary
0	000
1	001
2	010
3	011
4	100
5	101
6	110

- b) Show how the structure from part a) changes after inserting a record with the search key value of 16 and then deleting the record with the search key value of 11.
 - c) Why is a hash structure not the best choice for a search key on which range queries (*i.e.* select * from relation where key > a and key <=b) are likely?