

CS 353 Fall 2022

Homework 6

Due: December 13, Tuesday till midnight

You will use the Moodle course page for submission of this assignment

Q.1 [36 pts, 12 pts each] Construct a B+ tree for each of the following parts by inserting the following key values **in the given order**:

44, 20, 22, 32, 34, 46, 17, 38, 26, 18

You should use the insertion algorithm provided in the textbook.

- (a) The order of the tree (i.e., n) is 3 (i.e., each node can hold 2 search key values).
- (b) The order of the tree is 4.
- (c) The order of the tree is 5.

Q.2 [40 pts pts] Consider an extendable hash structure where buckets can hold 3 search key values. The entries with the key values listed below are inserted in the following order:

57, 28, 26, 98, 38, 79, 7, 109, 30

The hash function given is $h(x) = x \bmod 16$. The hash value of a search key is a 4-bit binary value. Use the most significant bit of the hash value during insertion.

- (a) **[25 pts]** Insertion of which key values leads to bucket splits? Which of those splits causes the bucket address table to double?
- (b) **[15 pts]** After inserting all key values,
 - i. What is the global depth of the bucket address table?
 - ii. What is the local depth of the bucket that contains 26?
 - iii. What is the local depth of the bucket that contains 109?
 - iv. What is the local depth of the bucket that contains 7?
 - v. What is the local depth of the bucket that contains 79?

Q.3 [24 pts]

- (a) **[8 pts]** If the size of a file is 5,000 pages, and the memory size is 50, what is the number of **merge passes** required to sort the file?
- (b) **[16 pts]** If the size of a file is 100,000, what is the minimum number of pages of memory required to sort the file in 2 **merge passes**?