CMPT506 – Advanced Database System
Fall 2016 – Homework

Due by 4pm on Sunday 13th November 2016– Submit your softcopy as a Word Document to blackboard and your hardcopy at the start of the class.

Q1 [10 pts]. A Student file has 30,000 records in fixed-length format with unspanned blocking. It is stored on a disk with 2.4KB blocks. Each record has the fields:

StudentID 9 bytes
LastName 20 bytes
FirstName 20 bytes
MidName_Initial 1 byte
DateOfBirth 10 bytes
Address 35 bytes
Phone 12 bytes
DepartmentID 4 bytes
Gpa 8 bytes
Deletion Marker 1 byte

[5pts] (a) Calculate the record size *R*, the blocking factor, *bfr*, and the number of disk blocks, *b*, needed for the whole file.
[2pts] (b) Calculate the wasted space because of the unspanned organization.
(c) Calculate the average number of block accesses to search for an arbitrary record in the file:

[1pt] (i) using a linear search with a unordered file organization,
[2pts] (ii) using a binary search on an ordering field.

Q2 [25 pts]. A PARTS file with Part# as the hash key includes records with the following Part# values: 1, 16, 20, 7, 27, 29, 18, 11, 22, 28, 9, 14.

Insert the records into an expandable hash file using **extensible hashing.** Assume a Bucket size of 2. Show the structure of the directory each time its structure changes; also show the global and local depths.

Q3 [20 pts]. Insert the records of Q2 into an expandable hash file using **linear hashing**. Assume a Bucket size of 2. Show how the file grows and how the hash functions change as the records are inserted. Assume that blocks are split whenever an overflow occurs.

Q4 [25 pts]. A PARTS file with Part# as the key field includes records with the following Part# values:
23, 65, 37, 60, 46, 92, 48, 71, 56, 59, 18, 21.
Suppose that the Part# values are inserted in the given order in a B+ Tree. Suppose that the maximum entries per node is **n = 3**; show how the tree will expand and what the final tree will look like.

Q5 [20 pts]. Suppose that the following search field values are deleted, in the given order, from the B+ Tree of **Q4**. Show how the tree will shrink and show the final tree. The deleted values are 65, 18, 92, 59, 37.