COMP6714 (13S2) MID-TERM EXAM

TIME ALLOWED: 1 HOUR

Name: _____

Student ID: _____

NOTE:

(1) Answer the questions briefly. Lengthy but irrelevant answers will be penalized.
(2) In most of the questions, you need to show major steps.

Q1. (*30 marks*)

Answer the following questions.

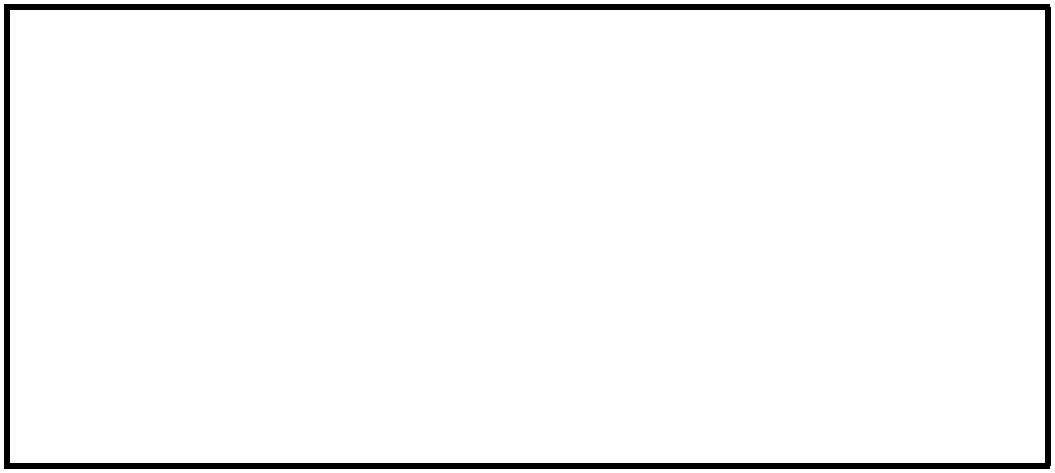
(1) What is the heuristic method to determine the execution order using the binary list merge algorithm to answer *conjunctive* keyword queries? Given a counter-example where this heuristic does not work well.
Your Answer:

(2) Given at least two reasons (with simple examples) why language identification is important when indexing documents.
Your Answer:

(3) Why specialized algorithms are needed to construct inverted index for large document collections?
Your Answer:

(4) What is the Heaps' Law and what is the Zipf's Law?
Your Answer:

(5) Give an intuitive explanation of the *two* major factors we consider when choosing the best candidate for *context-sensitive* spelling correction. (For example, `taw` may be corrected to either `the` or `thaw`)
Your Answer:



Q2. (*20 marks*)

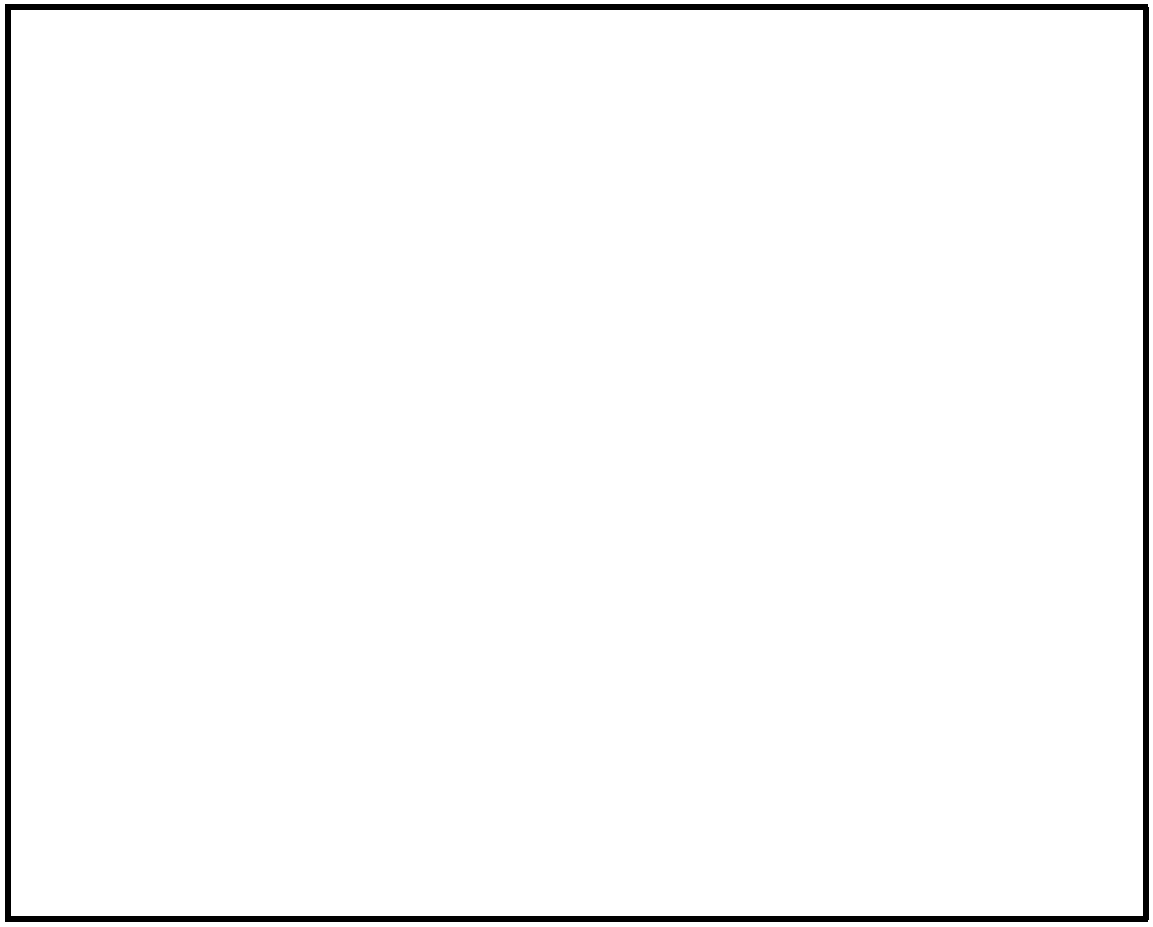
Complete the pseudocode of the function `Q2` (shown below) that answers the Boolean keyword query "A `AND (NOT` B`)`, where A and B are two different keywords. Make sure your pseudocode is easily readable (i.e., with indentation and comments if necessary).

You can assume the following functions/methods on `LA` or `LB`:

- `cur()` returns the current docID in the list;
- `eol()` returns `TRUE` if the current list is exhausted;
- `next()` moves the cursor to the next posting.

```
function Q2(LA, LB)
  // Let LA and LB be the corresponding inverted lists
  // of A and B, respectively
  ANSWER = []
  ...
  ...
  return ANSWER
end
```

Your Answer:



Q3. (*25 marks*)

Given a list of sorted strings of possibly different length, describe a method to use binary search to answer prefix query `P*`, where `P` is a non-empty string (You may use an additional $O(n)$ space for some auxiliary data structures)? Why B^+-tree index is still preferred over this binary-search-based solution for large collection of strings?

Your Answer:

Q4. (*25 marks*)

Consider using one of the three dynamic indexing methods, namely *immediate merge*, *no merge*, and *logarithmic merge*, to build the inverted index for a collection. Let $|C|$ be the total number of bytes of the documents in the collection, M be the memory size in bytes, and B be the number of bytes in a disk block.

We only consider the total number of blocks read from or written to the disk as the I/O cost; and you can safely ignore the ceiling or floor functions in the analysis. For example, reading 1000 bytes from the disk costs $\frac{1000}{b}$ I/Os.

(1) How many sub-indexes will the *no merge* method create? What is the total I/O cost of indexing the collection?
(2) How many sub-indexes will the *immediate merge* method create? What is the total I/O cost of indexing the collection?
(3) How many sub-indexes will the *logarithm merge* method create (you may consider the worst case)? What is the total I/O cost of indexing the collection?

Your Answer: