COMP 220 **Data Structures**

Exam 5

Fall 2018

For this take-home exam, you are not allowed to work with your classmates or consult internet question/answer sites, such as Stack Overflow. Use only your notes, the textbook, and C++ documentation pages.

Carry out parts of exercises 9 and 11 from chapter 12 (exercise 11 is just the tests for exercise 9). In particular, design and implement your own string class, including the documentation, declaration, tests, and implementation for each of the following methods:

- the constructor and destructor specified in the text
- `toString()` and `operator<<`
- `length()`
- `substr(start, n)`
- `operator+` (string concatentation)
- relational operators `==, !=, <, <=, >, >=` as described in the book

Exercise 9 describes some details that are missing here, especially for `substr`.

For this exam your string representation must work directly with `char`s stored in heap memory. That is, you are NOT allowed to use C++ standard library containers of `char`s, e.g., a `vector` of `char`s.

Implement this in Code::Blocks and submit as `exam5` using `handin` by
Thursday, November 8, 2:00 PM

Optional opportunities for bonus points:

- Implement the assignment operator and copy constructor.
- Implement the bracket-selection operator (and tests) as described in the text. Handle an out-of-bounds index by throwing an exception.
- Implement at most two of the relational operators with a *direct* comparison of the characters in your strings. Implement the other relational operators by calling other relational operators and apply boolean operators to the result.
- Any other `string` methods which you think are useful. Read the C++ `std::string` documentation for inspiration.

You will receive bonus points in proportion to the difficulty of the implementation. You do not need to *finish* any of the above to receive points; even a correct declaration and tests will receive a few points. Note: we have not covered all the material required for some of these bonus opportunities, so you will need to read the textbook to do them.