CSC 370 - SUMMER 2020
DATABASE SYSTEMS
ASSIGNMENT 1
UNIVERSITY OF VICTORIA

Due: Tuesday, May 19th, 2020 at **18:00 Victoria Time (PDT)**. **Late assignments will not be accepted.**

You must place your answers in the provided markdown template. Answers submitted in any other format will not be marked.

All of the questions below can be solved by hand, but you are free to write code (in whatever language you prefer) that helps you find the answers. If you use any code to generate your answer, you **must** attach a copy of your code to your assignment submission.

Question 1: Keys and Superkeys [6 marks]
Consider a relation Q on atomic attributes (A, B, C, D, E) and the following functional dependencies.

$$BC \rightarrow A$$
$$ABD \rightarrow CE$$
$$CD \rightarrow A$$

(a) List all of the superkeys of Q.
(b) List all of the candidate keys of Q.
(c) Give **one** new functional dependency of the form $X \rightarrow Y$ (with one attribute on each side) such that if your new dependency were added to the list above, the relation Q would have only one candidate key.

Question 2: Closures and Functional Dependencies [4 marks]
Consider a relation R on atomic attributes (A, B, C, D, E, F) and the following functional dependencies.

$$AB \rightarrow C$$
$$CD \rightarrow BF$$
$$AE \rightarrow C$$
$$AD \rightarrow E$$

(a) What is the closure of $\{A, B, E\}$?
(b) The relation R has only one candidate key. What is it?
(c) What is the highest normal form attained by the relation R under the dependencies above? Choose from 1NF, 2NF, 3NF and BCNF. Justify your answer; answers with no justification will receive no marks.

Question 3: Normal Forms [6 marks]
Consider a relation S on atomic attributes (A, B, C, D, E, F, G, H) and the following functional dependencies.

$$ACG \rightarrow B$$
$$B \rightarrow G$$
$$C \rightarrow D$$
$$G \rightarrow A$$
$$DE \rightarrow GC$$
$$H \rightarrow EF$$
$$DEF \rightarrow H$$

(a) List all of the FDs above that are 3NF violations.

(b) List all of the FDs above that are BCNF violations. This list will include all of the FDs from part (a), since a 3NF violation is automatically also a BCNF violation.