

Assignment #2

CSC343 Winter 2023

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I declare that this assignment is solely our own work, and is in accordance with the University of Toronto Code of Behaviour on Academic Matters.

This submission has been prepared using L^AT_EX.

Question 4

a) c:course, p:professor, ta:teaching assistant, l:location, d:day, t:time
Following are the functional dependencies inferred:

$$dtp \rightarrow c$$

$$c \rightarrow ta$$

$$dtl \rightarrow p$$

$$dtl \rightarrow c$$

$$dtc \rightarrow p$$

b) We identify that if we take the candidate key to be dtl, we can subsequently obtain all other relevant information from the schema.

dtl gives both c and p, and c gives ta.

Pf. First, we calculate closures to find the candidate keys.

$$d- > d, t- > t, l- > l, c- > (c, ta), p- > p$$

$$dt- > dt, .., dc- > (d, c, ta), ..$$

$$dtc- > (dtcta), dtp- > (dtpc), \text{ and finally } dtl- > dtlcpta \text{ (fd 3,4,2)}$$

So, we can use dtl as the candidate key. Since $dtl- > pc$ and $c- > ta$

Hence, removing the 3rd fd (as it can be obtained via 4th and 5th) since it is redundant.

Hence, minimal cover $F_c = \{dtp- > c, c- > ta, dtl- > c, dtc- > p\}$.

Now, we use the synthesis algorithm to convert this to 3nf.

Following relations will be created:

$$R_1(d, t, p, c)$$

$$R_2(c, ta)$$

$$R_3(d, t, l, c)$$

$$R_4(d, t, c, p) \text{ (redundant relation)}$$

Since R_3 contains the original candidate key dtl, we are done and the above relations satisfy 3NF