CPSC 304 Midterm 1
Oct 6, 2004
Total: 20 points

Question 1 (12 points)
Consider the relation $R = (A, B, C, D)$ with the following functional dependencies:
- (FD1) $A \rightarrow B$
- (FD2) $C \rightarrow D$

a) *Determine the candidate key(s) of R.*

b) *Pick any one of the candidate keys you specify for part a, and prove that it is indeed a candidate key. You can use Armstrong's axioms, the Union and the Decomposition rules in your proof.*

c) *Determine the highest normal form R is in. Explain your answer. (For example, if you think that R is in 3NF, then you should explain why it is in 3NF and why it is not in BCNF.)*

   YOU ARE NOT RESPONSIBLE FOR 1NF AND 2NF

d) *Decompose R , if necessary, so that all the resultant relations are in BCNF. Show that each one of your (decomposed) relations is indeed in BCNF.*

Question 2 (8 points)
Consider the following relation instance:

A	B	C
John	1	Van
John	1	Rmd
Jane	2	Rmd
Jane	2	Van
Jill	4	Bby
Jill	5	Cql

a) *Observe that B → A appears to hold with respect to the given instance. Check to see if all of the following dependencies hold with respect to the instance:*
   - *A → B*

   - *A → C*

   - *B → C*

   - *C → A*

   - *C → B*

b) *Determine the minimum number of tuples that can be added to the above instance to invalidate B → A. Demonstrate your answer by showing example(s) of such tuple(s).*
   (2 points) It takes two tuples to invalidate a functional dependency. Thus, the minimum number of tuples to add to the instance is 1.
   (1 point) We can add for instance the tuple <Jane, 1, Van> to the relation instance.

--- The End ---