COSC 471/571 Quiz 3/19/2019 (q0319) Name:______________________________

Closed book. 15 minutes

Definitions follow quiz questions.

1. This schema is in 1NF. Normalize to 2NF.

```
R (A, B, C, D)
```

primary key: B C

```
fds:  B C   -> A D
      C     -> D
```

2. This schema is in 2NF. Normalize to 3NF.

```
R (A, B, C, D, E)
```

primary key: A B

```
fds:  A B   -> C D E
      C     -> D
      D     -> E
```

3. Consider the definition of transitive dependency.

   In this schema, is B -> D a transitive dependency? Why or why not?

```
R (A, B, C, D)
```

primary key: A
candidate keys: A
B

```
fds:  A     -> B C D
      B     -> A C D
      B     -> D
```

Database Principles Definitions regarding Normalization

functionally dependent (-> , *fd*)

A and B are non-empty sets of attributes in relation R.

A -> B iff each value of A has associated with it exactly one value of B.

fully functionally dependent (*ffd*)

A and B are non-empty sets of attributes in R.

B is fully functionally dependent on A if A -> B, but B is not functionally dependent on any proper subset of A

transitively dependent

A, B and C are non-empty attributes of R such that A -> B and B -> C then C is transitively dependent on A via B (provided A is not functionally dependent on B or C)

2NF – simple definition

A relation is in 2NF when it is in 1NF and every non-primary key attribute is fully functionally dependent on the primary key

2NF – general definition

A relation is in 2NF when it is in 1NF, and every non-candidate key attribute is ffd on any candidate key.

3NF – simple definition

A relation is 3NF when it is in 2NF and no non-primary key attribute is transitively dependent on the primary key.

3NF – general definition

A relation is in 3NF when it is in 2NF and no non-candidate key attribute is transitively dependent on any candidate key.

BCNF

A relation R is in BCNF if whenever a non-trivial X -> A exists, then X is a superkey.

BCNF – alternate definition

A relation R is in BCNF if and only every determinant is a candidate key.

Decomposition of relation R is a set {R1, R2, ..., Rn} such that each Ri is a subset of R, and union over all Ri equals R. (i.e., same as “attribute preserving decomposition”)