# CS2102 Database Systems
**2014/2015 Semester I**

## Tutorial #5   Normal Forms

1. Consider the relation R (A, B, C, D, E) with the set of FDs

   F = { {A} → {B}, {BC} → {E}, {ED} → {A} }.

   a. List all the keys of R.  **CDE, ACD, BCD**

   b. Is R in 3NF?  **Yes, because B, E, A are all parts of keys.**

   c. Is R in BCNF?  **No, because none of A, BC, ED contain a key**

2. Consider the relation R(A, B, C, D, E) with the set of FDs F = {A → B, C → D}.

   a. If R in 3NF? If not, decompose it into a collection of 3NF relations.

      **Key is ACE. R is not in 3NF. Decompose to AB, CD, ACE**

   b. If R in BCNF? If not, decompose it into a collection of BCNF relations.

      **No. BCNF decomposition: AB, CD, ACE**

3. Suppose we have the following instance of a relation S with three attributes ABC.

   | A | B | C |
   |---|---|---|
   | 1 | 2 | 3 |
   | 4 | 2 | 3 |
   | 5 | 3 | 3 |

   Which of the following dependencies can you infer does not hold over relation S?

   a. A → B

   b. **BC → A does not hold. Look at tuples <1,2,3> and <4,2,3>**

   c. B → C

   Can you identify any dependencies that hold over relation S?

**No, given just an instance of S, we can say that certain dependencies (e.g., A → B and B → C) are not violated by this instance, but we cannot say that these dependencies hold with respect to S. To say that an FD holds w.r.t a relation is to make a statement about ALL allowable instances of that relation.**