Stevens Institute of Technology

Department of Computer Science

CS442: Database Management System

**Handout. Schema refinement**

1. Given FD={AB→CD, B→DE, C→F, E→G, A→B}. Prove that {A→FG} is logically implied by FD by two different methods: (1) by using Armstrong’s axiom; and (2) by using attribute closure.
2. Armstrong’s axiom
3. Attribute closure
4. Consider the relation schema R*(A, B, C, D)* with FDs: A→C and B→D. Is {A,B} a candidate key for R?
5. Consider a relation R(A,B,C). It has FDs: A -> B, B -> C, and C -> A. Assume R is decomposed into X={A,B} and Y={B,C}. Answer the following questions:
6. Is this decomposition lossless?
7. Is this decomposition dependency preserving?
8. Consider a relation R(A,B,C,D,E,F). It has FDs: AC → F, B → D, AB → CEF, ACE → B, and AEF → BC, answer the following questions:

* Find all candidate keys of R.
* Is relation R in the 3NF? If not, give an example of FD that violates the 3NF condition and explain why.
* Is relation R in BCNF? If not, give an example FD that violates the BCNF condition and explain why.
* If R does not satisfy BCNF, how to decompose R into BCNF tables?

1. Consider a relation R(ABCDE), and its FDs: ABCD→E, E→D, A→B, AC→D. Decompose R into 3NF tables.