

Stevens Institute of Technology  
Department of Computer Science  
CS442: Database Management System

**Handout 5. Schema refinement**

1. Consider a relation  $R(A,B,C,D,E,F)$ . It has FDs:  $AC \rightarrow F$ ,  $B \rightarrow D$ ,  $AB \rightarrow CEF$ ,  $ACE \rightarrow B$ , and  $AEF \rightarrow BC$ , 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?

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