

CECS 535: Introduction to Database

Spring 2020, Homework 3

DUE DATE: One week from today

NOTE: in the following, use parenthesis to distinguish a single, multiple-attribute key like (A,B) from several, single-attribute keys like A, B.

1. Given relation $R(A, B, C, D, E, F)$, give (i) the key(s) of R and (ii) the normal form of R if the FDs are
 - (a) $AB \rightarrow CD, C \rightarrow E, D \rightarrow F$.
 - (b) $A \rightarrow BCD, D \rightarrow EF$.
 - (c) $A \rightarrow BC, D \rightarrow EF$.
 - (d) $AB \rightarrow C, CD \rightarrow EF$
 - (e) $AB \rightarrow CD, D \rightarrow EF, C \rightarrow AB$.
 - (f) $ABC \rightarrow D, ABC \rightarrow E, ABC \rightarrow F$.
2. Consider the following table and FDs
ACTIVITY(customerid,fname,lname,address,zip,status,partid,date,price,quantity,material,color)
 $customerid \rightarrow fname,lname,address$
 $address \rightarrow zip$
 $partid \rightarrow price,material,color$
 $customerid,partid \rightarrow date,quantity,status$
 - (a) Give *all* the keys of **ACTIVITY**.
 - (b) Decompose **ACTIVITY** into 3NF relations. Make sure the decomposition is lossless.
3. Consider the following table and FDs

COMPLAINT(customer-id,product-id,date,time,color,size,name,address,zip)

$customer-id \rightarrow name,address$
 $address \rightarrow zip$
 $product-id \rightarrow color,size$
 $customer-id,product-id \rightarrow date,time$

Given the following decompositions, determine if lossless join holds (note: use the matrix method to give the answer; no points are given for a yes/no answer alone, even if correct).

- COMPLAINT1(customer-id,name,adress,zip), COMPLAINT2(product-id,color,size), COMPLAINT3(customer-id,product-id,date,time).

- COMPLAINT1(customer-id,name,address), COMPLAINT2(customer-id,zip), COMPLAINT3(product-id,color,size,customer-id,date,time).

4. Consider the following table and FDs

PRODUCT(pid,pname,price,pmfr,warehouse-origin,discount,type)

$\text{pid} \rightarrow \text{pname}, \text{pmfr}, \text{type}$
 $\text{pmfr}, \text{pname} \rightarrow \text{warehouse-origin}, \text{discount}$
 $\text{pmfr}, \text{type} \rightarrow \text{price}$
 $\text{pmfr}, \text{pname}, \text{type} \rightarrow \text{pid}$

- Give *all* the keys of PRODUCT.
 - Decompose PRODUCT into 3NF relations. Make sure the decomposition is lossless.
5. Consider the following table and FDs:

RENTAL(tool-id,toolname,client-id,address,day,price,length-rental)

$\text{tool-id} \rightarrow \text{toolname}$
 $\text{client-id} \rightarrow \text{address}$
 $\text{tool-id}, \text{client-id} \rightarrow \text{price}$
 $\text{tool-id}, \text{client-id}, \text{day} \rightarrow \text{length-rental}$

- Give *all* the keys of RENTAL.
 - Decompose RENTAL into 3NF relations. Make sure the decomposition is lossless.
6. Given the E-R diagram shown below, give a database schema (i.e. list of relations) for it. The diagram follows the textbook conventions for relations. Keys are in uppercase, multi-valued attributes in double-lined ellipses. **Make sure to give the keys for each relation (primary and foreign).**

