Test 3-1 (英文课堂) （2018-10-25）

1. Please explain the following terms (4 points):

(1) functional dependency

If A and B are attributes of relation R, B is functionally dependent on A (denoted A → B), if each value of A in R is associated with exactly one value of B in R.

(2) full functional dependency

B is fully dependent on A if B is functionally dependent on A but not on any proper subset of A.

$$\text{If } A \rightarrow B, \text{ and for any } X \subset A,\ X \not\rightarrow B, \text{ then } A \xrightarrow{f} B$$

(3) partial functional dependency

B is partially dependent on A if B is functionally dependent on A's proper subset X.

$$\text{If } A \rightarrow B, \text{ and for } X \subset A,\ X \rightarrow B, \text{ then } A \xrightarrow{P} B$$

(4) transitive functional dependency

if A → B and B → C, then C is transitively dependent on A through B.

2. Given R(A,B,C,D)，F={A→B,C→D},ρ={R_1(AB)，R_2(CD)} , Please check if ρ keeps Lossless-join property **and** Dependency Preservation. (3 points)

Solution:

$F_1=\pi_{R1}(F)=\{A\rightarrow B\}$, $F_2=\pi_{R2}(F)=\{C\rightarrow D\}$

$R_1 \cap R_2=AB\cap CD=\Phi$, $R_1-R_2=AB$, $R_2-R_1=CD$

Φ→AB not belong to F, Φ→CD not belong to F

∴ρ is Lossy-Join Decomposition.

$F_1 \cup F_2=\{A\rightarrow B,C\rightarrow D\}=F$, $F_1 \cup F_2 \equiv F$

∴ρ is Dependency preserving

3. Given the following relation R and its functional dependency set F, please give the candidate keys, and judge whether R is in BCNF， if not, decompose R into BCNF. (3 points)

SP={ SNO,SNAME,CITY,STATUS },

F={ SNO→SNAME,SNO→CITY, CITY→STATUS }

Solution:

Non-primary key attribute STATUS is transitively functional dependent on candidate key SNO, so SP is in 2NF, but not in 3NF.

Decompose it：

SP1={ SNO,SNAME,CITY }, SP2={ CITY,STATUS } both are in BCNF.

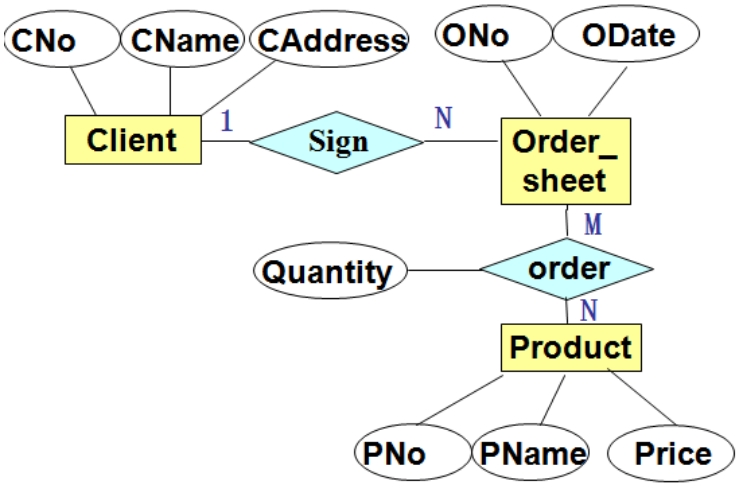
4. DB design (5 points)

Suppose an organization needs to manage the following information: order number, client number, client name, client address, product number, product name, product price, ordered product quantity(Quantity), order date. One client can have many order sheets and there can be many products ordered in one order sheet.

(1)Please draw E-R model

(2)Transform the above E-R model to relational data model (logical model).

E-R Diagram：



Client（CNo，CName，CAdrress） ----------（2 分）

Product（PNo，PName，Price）----------（2 分）

Order_Sheet（ONo，CNo，ODate）----------（2 分）

Order（ONo，PNo，Quantity）

<PK>=（ONo，PNo ），<FK1>=ONo，<FK2>=PNo ----------（2 分）