

Problem 3

You should determine if the *Student*, *Lender*, and *Institution* tables are in BCNF. In the *Lender* table, *LenderName* is unique. In the *Institution* table, *InstName* is unique. In the *Student* table, *StdEmail* is unique. The primary key of each table is underlined. The primary key of each table is underlined. You should explain your decision and modify the table design by splitting tables or adding constraints if necessary.

Student (StdNo, StdName, StdEmail, StdAddress, StdCity, StdState, StdZip)

Lender(LenderNo, LenderName)

Institution(InstNo, InstName, InstMascot)

Solution:

- If the StdZip given is the 9 digits US Zip Code (in case of US) or any other country's zip which can independently describe the city and state then, the student table is not in BCNF because $\text{StdZip} \rightarrow \text{StdCity}, \text{StdState}$. If this FD is significant, split student into 2 tables with StdZip, StdCity and StdState in a new table. StdZip is the primary key of the new table.
- The StdEmail can also determine the other columns uniquely as is also given in the problem statement so a unique constraint is specified for it.
- The LenderName is unique as is given in the problem statement so a unique constraint is specified for it.
- The InstName can also determine the other columns uniquely as is also given in the problem statement so a unique constraint is specified for it.

So, if the FD $\text{StdZip} \rightarrow \text{StdCity}, \text{StdState}$ is significant and valid then we have the following tables:

Student (StdNo, StdName, StdEmail, StdAddress, StdZip)
 UNIQUE StdEmail
 FOREIGN KEY (StdZip) REFERENCES (StudentZip)

StudentZip (StdZip, StdCity, StdState)

Lender (LenderNo, LenderName)
UNIQUE LenderName

Institution (InstNo, InstName, InstMascot)
UNIQUE InstName

Note: The above splitting is done assuming the Zip can determine City and State.