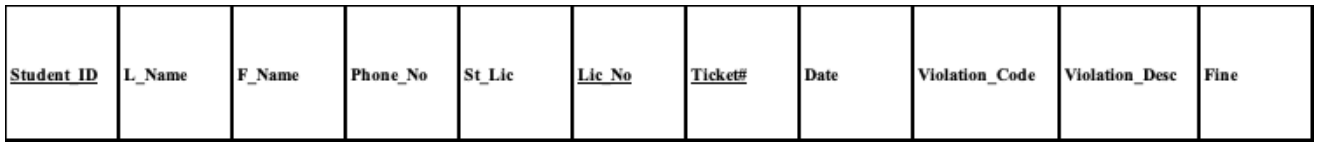
Normalization

The University Parking Office currently stores its parking ticket data in an excel spreadsheet as the table below shows. You are hired to create a database for the Parking Office.

Student_ID	L_Name	F_Name	Phone_No	St_Lic	Lic_No	Ticket#	Date	Violation_Code	Violation_Desc	Fine
38249	Brown	Thomas	111-7804	FL	BRY 123	15634	10/17/08	2 1	Wrong way parked Blocking public or private driveway	$25 $15
82453	Green	Sally	391-1689	AL	TRE 141	14987	10/05/08	3	On-street handicapped parking	$100
82453	Green	Sally	391-1689	AL	TRE 141	16293	11/18/08	1	Blocking public or private driveway	$15
82453	Green	Sally	391-1689	AL	TRE-141	17892	12/13/08	2	Wrong way parked	$25

1. **Identify and boldface all determinants and diagram all functional dependency relationships using arrows.**

   Functional dependency diagram:



   Student_ID > L_Name > F_Name > Phone_No> Lic_No > St_Lic
   Lic_No > St_Lic> Student_ID>> L_Name > F_Name > Phone_No
   Ticket#> Date> Violation_Code> Violation_Desc>Fine

2. **Is the table normalized in 1NF and explain why.**

No it is not normalized in 1NF, because one of the characteristics of 1NF is 'no multivariate attributes', if we see the violation description,some have more than 1 reason listed in the same box for Thomas Brown. In order to fix this, please see the updated table below:

Student_ID	L_Name	F_Name	Phone_No	St_Lic	Lic_No	Ticket#	Date	Violation_Code	Violation_Desc	Fine
38249	Brown	Thomas	111-7804	FL	BRY 123	15634	10/17/08	2	Wrong way parked	$25
38249	Brown	Thomas	111-7804	FL	BRY 123	15634	10/17/08	1	Blocking public or private driveway	$15
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3. Is the table normalized in 2NF and explain why.

Table not normalized in 2NF. As per 2NF, the table should be in 1NF and not contain any Partial Dependency. By applying 2NF, the relational schema is as follows:

Functional Dependencies:

Student_ID > L_Name > F_Name > Phone_No
Lic_No > St_Lic
Ticket#, Student_ID, Lic_No> Date> Violation_Code>Violation_Desc >Fine

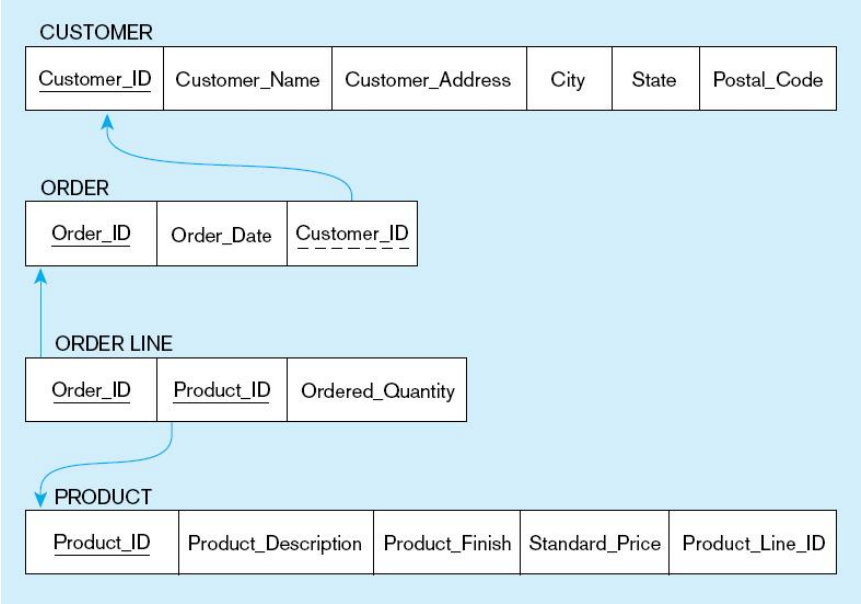
Tables in 2NF:

Student(Student_ID, Lic_No, L_Name, F_Name, Phone_No)
License(Lic_No, Student_ID, St_Lic)
Ticket (Ticket#, Lic_No, Date, Violation_Code, Violation_Desc, Fine)

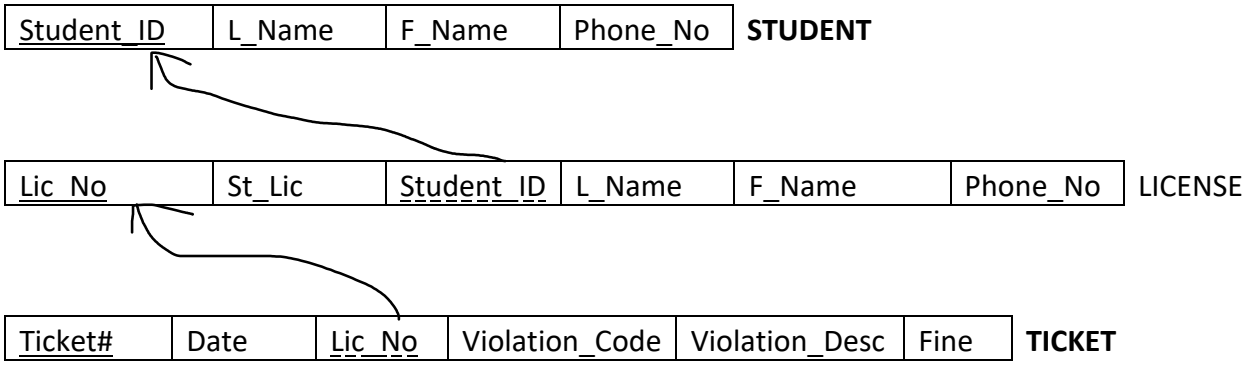
4. Is the table normalized in 3NF and explain why.

The table is not normalized in 3NF. In order to be in 3NF, it should be in 2NF, and there should not be any transitive dependency.

5. Change the table structure so that it is in 3NF. Mark the primary keys using underline and foreign keys using dashed underline. Use an arrow to link the primary key-foreign key pair with arrows pointing to the primary key. See the sample diagram below.


CUSTOMER
Customer_ID
Customer_Name
Customer_Address
City
State
Postal_Code
ORDER
Order_ID
Order_Date
Customer_ID
ORDER LINE
Order_ID
Product_ID
Ordered_Quantity
PRODUCT
Product_ID
Product_Description
Product_Finish
Standard_Price
Product_Line_ID

3NF:


Student_ID
L_Name
F_Name
Phone_No
STUDENT
Lic_No
St_Lic
Student_ID
L_Name
F_Name
Phone_No
LICENSE
Ticket#
Date
Lic_No
Violation_Code
Violation_Desc
Fine
TICKET