Q1)solution:

1a) Student

|  |
| --- |
| Student id |
| First name  Last name  Date of birth  Street Address  City  state |

1b)

student

|  |
| --- |
| student id |
| First name  Last name  Dob  Street Address  City  state |

|  |
| --- |
| Class id  Class name |

Class member class

|  |
| --- |
| Class id  Student id |

Problem Statement 2 : 1NF form

1. **Describe a situation that could lead to an update anomaly.**

* Some of the update anomalies identified are:
* Updating the advisor - Mr. Jones is in two rows.
* Updating the Classes - For example, Physics and Art are listed several times.

1. **How could an insert anomaly occur with this table?**

* Adding a new advisor would not be possible with a student & a class list for this this student.  Attempting to do so would result in NULLs for the other fields.

1. **When could a deletion anomaly affect the table?**

* Attempting to delete Mr. Jones or Physics could cause anomalies in the other rows.

1. **The above table is not normalized.  Describe changes would you make to the table to adopt it to 1st normal form.**

* Remove the repeated Class columns from the table.
* Student column is a composite value and should be broken into First and Last names.
* There is no primary key, I would establish student (StudentFirst, StudentLast), and class as the composite primary key.

Problem Statement 3 : 2NF Form

1. **What normal form is the table shown in the assignment’s instructions?**

* It is in the first normal form.

1. **Why is the table not in the second normal form?  List the reasons the rules are being broken.**

* Some of the columns are not fully dependent on the primary key. For instance:

Student Gender, though dependent on Student First and Student Last, it is not dependent on Class, Classroom is not dependent on Student First and Student Last

1. **Create a design which conforms to the second normal form.  What tables would you use?**

Here is the design I came up with.  There are four tables:

* **Student table** – houses student information. With StudentId as Primary key and ClassID as foreign key.
* **Class table** – used to store information about the class name and room and advisor with ClassID as the primary key.

1. Student Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sudent id | First Name | LastName | Gender | Class id |
| ST001 | Mary | Smith | F | CL001 |
| ST002 | Mary | Smith | F | CL002 |
| ST003 | Mary | Smith | F | CL003 |
| ST004 | Mary | Smith | F | CL004 |
| ST005 | jack | knowels | M | CL005 |

1. Class Table

|  |  |  |  |
| --- | --- | --- | --- |
| Class id | Class Name | Class Room | Advisor |
| CL001 | Algebra | A20 | Mr. jones |
| CL002 | Chemistry | B10 | Mr. jones |
| CL003 | English Lit. | B15 | Mr. jones |
| CL004 | European History | A10 | Mr. jones |
| CL005 | Physics | A15 | Mr. jackson |

Problem Statement 4 : 3NF

Solution as follows,

1. **Transitive dependency is involved in this table ? If Yes, then explain how its columns are transitive in nature.**

* Yes , this table has Transitive dependency
* Dependency is Population  **depends** on CustomerCity **depends** on CustomerId

1. **Redesign the schema to remove the transitive dependency to convert it into 3NF form.**

* Take the City Name out of the table and put it in a separate table.

1. **Customer** Table

|  |  |  |
| --- | --- | --- |
| Customer id | Customer Name | City id |
| C1000 | Ford | CI10 |
| C1010 | GM | CI20 |
| C1020 | Dell | CI30 |
| C1030 | HP | CI40 |
| C1040 | Apple | CI50 |
| C1050 | Boeing | CI60 |

1. **City Details** Table

|  |  |  |
| --- | --- | --- |
| City id | City Name | Population |
| CI10 | Dearborn | 94000 |
| CI20 | Detroit | 670000 |
| CI30 | Austin | 950000 |
| CI40 | Palo alto | 67000 |
| CI50 | Cupertino | 60000 |
| CI60 | chicago | 2700000 |