1. EMPLOYEE ( Name, Project, Task, Office, Floor, Phone ) **Note**: Keys are underlined.

Example Data:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Project** | **Task** | **Office** | **Phone** |
| Bill | 100X | T1 | 400 | 1400 |
| Bill | 100X | T2 | 400 | 1400 |
|  |  |  |  |  |
| Bill | 200Y | T1 | 400 | 1400 |
| Bill | 200Y | T2 | 400 | 1400 |
| Sue | 100X | T33 | 442 | 1442 |
| Sue | 200Y | T33 | 442 | 1442 |
| Sue | 300Z | T33 | 442 | 1442 |
| Ed | 100X | T2 | 588 | 1588 |

|  |  |  |
| --- | --- | --- |
| **Normal Form** | **Yes/No** | **Solution** |
| 1NF | Yes |  |
| 2NF | No | Employee\_1 (Name, Office, Phone)  Employee\_project (Name, Project, Task) |
| 3NF | No | Employee\_2 (Name, Office)  Office\_1 (Office, Phone)  Employee\_project (Name, Project, Task) |
| BCNF | Yes |  |

**Sol**: ( Name, Project, Task ) 🡪 Office, Phone

Name 🡪 Office, Phone

Office 🡪 Phone

Phone 🡪 Office

1. CUSTOMER (CustomerID, Name, Street, City, State, Zip, Phone). **Example Data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CustomerID** | **Name** | **Street** | **City** | **State** | **Zip** | **Phone** |
| C101 | Bill Smith | 123 First St. | New Brunswick | NJ | 07101 | 732­555­1212 |
| C102 | Mary Green | 11 Birch St. | Old Bridge | NJ | 07066 | 908­555­1212 |

|  |  |  |
| --- | --- | --- |
| **Normal Form** | **Yes/No** | **Solution** |
| 1NF | Yes |  |
| 2NF | Yes |  |
| 3NF | No | Customer (CustomerID, Name, Street, Zip, Phone)  Zip (Zip, City, State) |
| BCNF | Yes |  |

**Sol**: CustomerID 🡪 (Name, Street, City, Zip, Phone)

Zip 🡪 City, State

1. Department Complaints – **Convert to 3NF**

Assume that the dept# and cust# are needed to uniquely identify the date and nature of the complaint about the department.

Completely Un-normalized Table

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dept# | DeptName | Location | MgrName | MgrID | TelExtn | Cust# | CustName | Date of  Complaint | Nature of  Complaint |
| 11232 | Soap Division | Cincinnati | Mary  Samuel | S11 | 7711 | P10451  P10480 | Robert Drumtree  Steven  Parks | 1/12/1998  1/14/1998 | Poor Service  Discourteous  Attendant |

|  |  |  |
| --- | --- | --- |
| **Normal Form** | **Yes/No** | **Solution** |
| 1NF | No | Department🡪 Dept#, DeptName, Location, MgrID, MgrName, TelExtn  Complaint 🡪 Cust#, CustName, Dateofcomplaing, Natureofcomplaint, Dept# |
| 2NF | No | Assuming a department can have multiple managers. Each department is in only one place.  Department🡪 Dept#, DeptName, Location, MgrID, MgrName, TelExtn  Customer 🡪 Cust#, CustName  Complaint 🡪 Cust#, Dept#, Dateofcomplaing, Natureofcomplaint |
| 3NF | No | Complaint 🡪 (Dept#, Cust#, Dateofcomplaint, Natureofcomplaint)  Customer 🡪 (Cust#, CustName)  Manager 🡪 (MgrID, MgrName, TelExtn, Dept#)  Department 🡪 (Dept#, DeptName, Location) |

**Sol**:

1. Employee and Department Info

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DeptNumber | DeptName | EmpNumber | EmpFName | EmpLName | TitleName |
| 10 | IT | 101 | Dave | Duncan | Manager |
| 10 | IT | 201 | George | Gartner | Programmer |
| 10 | IT | 301 | Susan | Song | Analyst |
| 20 | ACCT | 200 | Larry | Ludwig | Accountant |
| 20 | ACCT | 322 | Yolanda | Yamato | Manager |

**Sol:**

|  |  |  |
| --- | --- | --- |
| **Normal Form** | **Yes/No** | **Solution** |
| 1NF | Yes |  |
| 2NF | No | Department 🡪 DeptNumber, DeptName  Employee 🡪 EmpNumber, EmpFName, EmpLName, TitleName, DeptNumber |
| 3NF | Yes |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ProductID** | **ProductName** | **ProductPrice** | **Color** | **StoreLocation** |
| 100 | Table | 100 | Black | 1 |
| 200 | Chair | 80 | Blue | 1 |
| 100 | Table | 100 | Blue | 2 |
| 200 | Chair | 80 | Black | 2 |
| 200 | Chair | 80 | Red | 3 |
| 300 | Bottle | 25 | Black | 1 |
| 300 | Bottle | 25 | Red | 2 |

**Sol:**

|  |  |  |
| --- | --- | --- |
| **Normal Form** | **Yes/No** | **Solution** |
| 1NF | Yes |  |
| 2NF | No | ProductID, Storelocation are primary keys.  Product 🡪 ProductID, ProductName. Productprice  Store 🡪 ProductID, Storagelocation, Color  (or) ProductID, Color are primary keys  Product 🡪 ProductID, ProductName. Productprice  Description 🡪 ProductID, Color, Storagelocation |
| 3NF | Yes | Because,  Here, Productprice is determined with productname also.  Sometimes, it is not necessary to go on dividing. |

**Tips**:

1. What are the rows that uniquely identify a row?