Computer Science 303 Assignment

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1. At first glance our database given to us looks very messy and jumbled up. Looking at our table it seems like there are multiple functional dependencies present. It seems like the entire table is functionally dependent on Employee ID. Because a functional dependence can basically be summarized as the following:

A functional dependency is a relationship between two sets of attributes in a relational database. Specifically, a functional dependency occurs when one set of attributes uniquely determines another set of attributes.

In this table Employee ID is being used to assign values to all the other columns in this one big table. Each Employee ID allows us to uniquely identify all the rest of the attributes of the entities in the table. Employee first and last name are functionally dependent on Employee ID. Street address, city, state and zip code are functionally dependent on Employee ID. Department, Manager ID and Position are also functionally dependent on Employee ID. When we look at the table we can almost immediately identify columns that can be categorized in their own independent tables. Meaning they share some characteristics or relationships. Because the definition of Transitive Dependency given to us is the followng:

This is called transitive dependence, whereby the value of a column or field within a table relies on another column in that same table, which is facilitated through another column located between them.

This can help us identify transitive dependencies in the table given to us. We can draw a diagram in transitive dependency notation to represent these dependencies:

* Department **→** Manager ID: Knowing the Department allows us to determine the Manager ID. For example, the "Board of Directors" department is managed by the employee with Manager ID 1000.
* Department **→** Position: The Position is determined by the Department. For instance, within the "Administration" department, the Position is "Vice President."
* Department→ Salary: The Salary can be inferred from the Department. For example, in the "Information Technology" department, the salary for "Programmer I" is either $45,000 or $60,000, and for "Programmer II" is $70,000.

1. It looks like Employee ID is the best primary key for the initial table(s) we make.
2. As we look at the table given to us it becomes quite apparent to us that this table is not in 3rd normal form. Before we dive deeper into why this table is not in 3rd normal form. I think it might be helpful to understand what characteristics categorize a table as being in 3rd normal form. A table is said to be in 3rd normal form when it has unique entries in every row. That is to say that at every intersection of a column and a row. There should be one unique entry of data.  And the data entered should be of the same data type/format. This concept is also referred to Data Atomicity. So, for 1st Normal Form we should have atomic data. A table is said to be in 2nd norm when it is already in 1st normal form and all non-key attributes present within the table are functionally completely dependent of the primary key. This is also called a table having no partial dependencies. Lastly, the criteria for a table to be in 3rd normal form the table has to already be in 1st and 2nd normal form. In addition to this the table has to have all transitive dependencies eliminated. A transitive dependency is when one or multiple non key attributes in the table are dependent on other non-key attributes instead of being directly dependent on the primary key.  So given this criterion it seems like the table given to us is in 1st normal form because it does have data atomicity and no data redundancy. All rows have separate, unique and non-repeating entries. Except maybe zip code but it has separate entries for every address, so it is not really repeating. Also, the table is in 2nd normal form because all non-key attributes in the table are functionally dependent on the primary key. And there are no partial dependencies. Finally, this table is not in 3rd normal form because there are some transitive dependencies present in the table. Such as the transitive dependencies of salary, manager id and position on the department attribute. Which means salary, manager id and position are non-key attributes that are not dependent of employee id which is the primary key. Rather, they are depending on another non key attribute i.e department. Hence, this table in its present form cannot be in 3rd normal form.
3. The table in its present form seems to have achieved 1st and 2nd normal forms. This is because we have data atomicity which means for every intersection of row and column, we have a singular unique data entered. And the data entered has the same format. Furthermore, this table is also in 2nd normal form because all the non key attributes are functionally depending on employee id which is a primary key and there are no partial dependencies.
4. Employee table

CREATE TABLE Employee (

Employee\_ID INT PRIMARY KEY,

Employee\_Last\_Name VARCHAR(50),

Employee\_First\_Name VARCHAR(50),

Address\_ID INT,

Job\_ID INT,

Department\_ID INT,

FOREIGN KEY (Address\_ID) REFERENCES Address(Address\_ID),

FOREIGN KEY (Job\_ID) REFERENCES Job(Job\_ID),

FOREIGN KEY (Department\_ID) REFERENCES Department(Department\_ID)

);

Address table

CREATE TABLE Address (

Address\_ID INT PRIMARY KEY AUTO\_INCREMENT,

Street\_Address VARCHAR(100),

City VARCHAR(50),

State VARCHAR(2),

ZIP\_Code VARCHAR(10)

);

Job table

CREATE TABLE Job (

Job\_ID INT PRIMARY KEY AUTO\_INCREMENT,

Position\_Title VARCHAR(50),

Salary DECIMAL(10, 2)

);

Department table

CREATE TABLE Department (

Department\_ID INT PRIMARY KEY AUTO\_INCREMENT,

Department\_Name VARCHAR(50),

Manager\_ID INT

);

**Inserting Data**

INSERT INTO Address (Street\_Address, City, State, ZIP\_Code)

VALUES

('312 Maple Drive', 'Anytown', 'FL', '32829'),

('1200 First Street', 'Anytown', 'FL', '32829'),

('4989 Fleur de Lane', 'Sometown', 'FL', '32829'),

('12 Arcadia Avenue', 'Anytown', 'FL', '32829'),

('687 Gulf View Street', 'Sometown', 'FL', '32830'),

('1209 Pine Tree Lane', 'Sometown', 'FL', '32831'),

('5435 Main Street', 'Anytown', 'FL', '32831'),

('3 Post Drive', 'Sometown', 'FL', '32831');

INSERT INTO Job (Position\_Title, Salary)

VALUES

('President', 100000),

('Vice President', 95000),

('Vice President', 75000),

('Programmer II', 70000),

('Programmer I', 45000),

('Programmer I', 60000),

('Sales Representative', 50000),

('Sales Representative', 35000);

INSERT INTO Department (Department\_Name, Manager\_ID)

VALUES

('Board of Directors', 1000),

('Administration', 1005),

('Information Technology', 1015),

('Sales', 1021);

INSERT INTO Employee (Employee\_ID, Employee\_Last\_Name, Employee\_First\_Name, Address\_ID, Job\_ID, Department\_ID)

VALUES

(1005, 'Doe', 'Janet', 1, 1, 1),

(1010, 'Eyre', 'Jane', 2, 2, 2),

(1011, 'Bronte', 'Charlotte', 3, 3, 2),

(2060, 'Poe', 'Edgar', 4, 4, 3),

(2090, 'Dickens', 'Charles', 5, 5, 3),

(2100, 'Doyle', 'AC', 6, 6, 3),

(3230, 'Uberville', 'Tess', 7, 7, 4),

(3330, 'Dumas', 'Alex', 8, 8, 4);

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