

CPT140 – Database Concepts

Assignment 2

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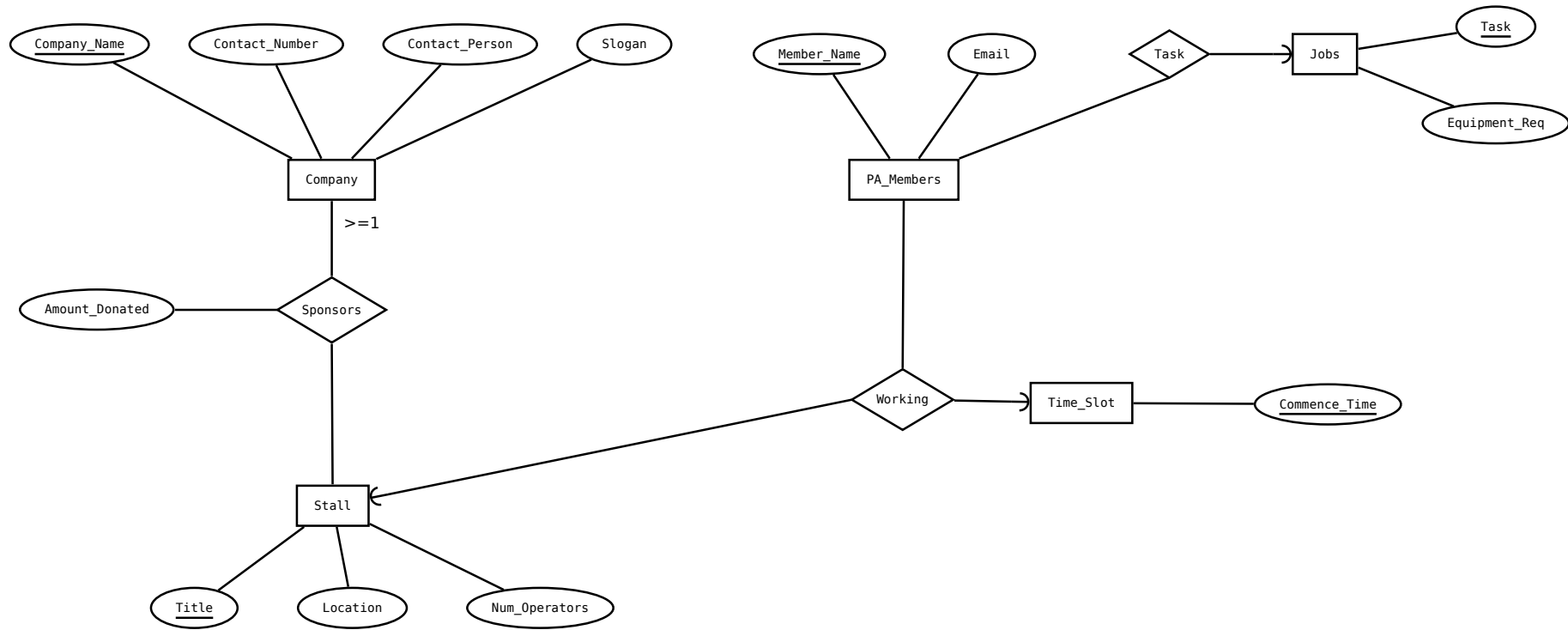
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Question 1

- 1.** DBMS stands for Database Management System. This refers to software that allows for the creation and management of large amounts of data stored within a database. This software also allows the user to run queries on the stored data.
- 2.** An update anomaly is where the same information is expressed on multiple rows and when updated is not correctly applied to all instances. This causes inconsistent/multiple sets of data to be the result of a query.
- 3.** An Alias is a method of giving a table an alternative name using the SQL function 'AS' it is often used to shorten the table name to make a query easier to create and read.
- 4.** Data Definition Language – A series of syntax which allows for the addition, changing or deletion of tables or other objects within a database.
- 5.** Domain – Domain refers to the allowable values of an attribute.

Question 2



Question 3.

3(A)

a.

Minimal Basis:

RegNo \rightarrow Make

RegNo \rightarrow Model

RegNo \rightarrow Commission

RegNo \rightarrow SalesPerson

BuyerName \rightarrow Address

The key for this relation is {RegNo, BuyerName}.

b.

After doing the minimal basis and determining the key we are left with the following FD's:

FD1. RegNo \rightarrow Make, Model, Commission, SalesPerson

FD2. Buyername \rightarrow Address

Unfortunately this is not in BCNF. For this to be in BCNF both FD1 and FD2 need to be superkeys, in this instance neither is a Superkey as RegNo on it's own cannot determine Address or BuyerName, and BuyerName alone can only determine Address.

c.

Constructing Relations:

R1 (RegNo, Make)

R2 (RegNo, Model)

R3 (RegNo, Commission)

R4 (RegNo, SalesPerson)

R5 (BuyerName, Address)

Combining Relations:

CarSales1 (RegNo, Make, Model, Commission, SalesPerson)

CarSales2 (BuyerName, Address)

CarSales3 (RegNo*, BuyerName*)

(B)

To prove this decomposition is incorrect we will complete the 3NF decomposition.

Minimal Basis:

Make, Model \rightarrow Engine_Size

Registration_No \rightarrow Make

Registration_No \rightarrow Colour

Registration_No \rightarrow Model

Engine_Size \rightarrow Tow_Load

Using inference rules we can determine that {Registration_No} is the key as it can determine all other values.

Constructing Relations:

R1 (Make, Model, Engine_Size)

R2 (Registration_No, Make)

R3 (Registration_No, Colour)

R4 (Registration_No, Model)

R5 (Engine_Size, Tow_Load)

Combining Relations:

CAR_DETAILS1 (Registration_No, Make, Model, Colour, Engine_Size*)

CAR_DETAILS2 (Engine_Size, Tow_Load)

At this point we have ended with the same decomposition as specified however there is an issue with an FD contained within CAR_DETAILS1 as follows:

Make, Model \rightarrow Engine_Size is not a valid key and as such this fails BCNF.

To correct this we can combine the relations as follows:

CAR_DETAILS1 (Registration_No, Colour, Make, Model)

CAR_DETAILS2 (Engine_Size, Tow_Load)

CAR_DETAILS3 (Make, Model*, Engine_Size*)

```
/* Question 4 */
```

```
/* Question 1. */
```

```
SELECT COUNT (DISTINCT Instname)
FROM Department
WHERE Instname LIKE '%Technology%';
```

```
/* Question 2. */
```

```
SELECT *
FROM Academic
WHERE AcNum IN (SELECT AcNum
FROM Interest
GROUP BY AcNum
HAVING count(*) >= 5)
AND EXISTS (SELECT AcNum
FROM Author
GROUP BY AcNum
HAVING count(*) <10);
```

```
/* Question 3 */
```

```
(SELECT AcNum
FROM Author
GROUP BY AcNum
HAVING count(*) >5)
INTERSECT
(SELECT AcNum
FROM Interest
GROUP BY AcNum
HAVING count(*) >3);
```

```
/* Question 4 */
```

```
/*
```

The SQL query from Question 4 will output the First Name, Last Name and Institution Name of Academics

who have authored a Paper but have no listed Interests recorded. It also narrows this down further by only including

Academics from the Computer Science department.

It is achieved using three SQL subqueries. The first (IN) reduces the total number of Academics down to those who have

been listed as an Author in a paper. The second (NOT IN) takes out all the Academics who have an Interest listed.

Finally the last (IN) narrows it down to only those who are in the Computer Science department.

```
*/
```

```
/* Question 5 */
```

```
SELECT AcNum
FROM Author
WHERE AcNum NOT LIKE 151
AND PaNum IN
(SELECT PaNum
FROM Author
WHERE AcNum = 151)
GROUP BY AcNum;
```

/* Question 6 - Note: The below is not complete/working */

```
SELECT PaNum
FROM Author, Academic
WHERE PaNum NOT LIKE 151
GROUP BY PaNum
HAVING count(*) >5
AND WHERE AcNum Author.AcNum=Academic.AcNum
GROUP BY AcNum
HAVING count(*) <=1
```