Database Assessment1

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TASK1

task1.1

Table1:Manager

{MID,CID,FYEAR} →{MID, MNAME，HCNAME, CID, CNAME, FYEAR}

MID,CID,FYEAR together can be the PK of table 1, functional determines all attributes.

MID→{MNAME，HCNAME}

MID determines MNAME and HCNAME

CID→CNAME , CNAME→CID

CID and CNAME determines each other, because they are both unique.

{CID,MID} →CNAME, {CID,CNAME} →MID

CID and MID can together determine MID, vice .

{MID，FYEAR}→CNAME

MID and FYEAR together determine CNAME, thus, if we know a MID and FYEAR of a manager, we know the team he joined that year, because a manager can only join one team maximumly a year.

Table2:CEO

{MID,DID} →{MID, DIRECTOR，DID, RESPONSIBILITY}

MID,DID together can be the PK of table2, functional determines all attributes.

DID→DIRECTOR, **DIRECTOR→DID**,

DID and DIRECTOR determines each other according to the instances given

DID→RESPONSIBILITY

DID determines RESPONSIBILITY according to the instances given, because one DIRECTOR seems can only be assigned to the same responsibility even though he can direct different managers.

Table3:COURSE

{COURSE,DID,TEXTBOOK}→{COURSE,DID,TEXTBOOK}

COURSE ,TEXTBOOK and DID together can be the PK of table 3, functional determines all attributes.

This is a Trivial Functional Dependency because the PK consists of all attributes.

task1.2

Table1:

Update Anomaly: If CNAME updates, e.g., HR changes to HUMANRESOURCE, then we need to update all the tuples in which manager worked in HR team, otherwise the manager would be working in a non-existent team.

Table2:

Delete Anomaly: If we delete the tuple which has Burn as the director, we lost the information of Investment responsibility as well.

Table3:

Delete Anomaly: If we delete DID 1, then we have to delete the tuple with 1 as DID, then we lost the information of TEXTBOOK Principles in HR.

task1.3

Table1

step1:

{MID, CID, CNAME, FYEAR}

{MID, MNAME，HCNAME}

explanation:

MNAME and HCNAME Partly dependent on MID, thus, the relation is not 2NF, we split origin relation into two.

step2:

{MID, CID, FYEAR}

{MID, MNAME，HCNAME}

{CID, CNAME}

explanation:

CNAME Partly dependent on CID, thus, the relation is not 2NF, we split the relation into two.

Now the table1 has been normalized to BCNF.

Table2:

step1:

{MID, DID}

{DID，DIRECTOR，RESPONSIBILITY,}

explanation:

DIRECTOR and RESPONSBILITY Partly dependent on DID, thus, split the relation into two.

Now the table2 has been normalized to BCNF.

task1.4

Based on the anomaly in task 1.2, we split COURSE relation into two:

{COURSE,DID}

{COURSE,TEXTBOOK}

reason: If we do so, TEXTBOOK and DID are no longer in the same tuple, when we need to delete attribute of DID, we will not lose information of TEXTBOOK in the tuple.

PKs have been underlined.

TASK2

task2.1

Table1:

```
CREATE TABLE MANAGER1(
    MID INT,
    CID INT,
    FYEAR INT,
    PRIMARY KEY (MID,CID,FYEAR)
);

CREATE TABLE MANAGER2(
    MID INT PRIMARY KEY,
    MNAME VARCHAR(10),
    HCNAME VARCHAR(20)
);

CREATE TABLE MANAGER3(
    CID INT PRIMARY KEY,
```

```
    CNAME VARCHAR(10)
);

ALTER TABLE MANAGER1
    ADD CONSTRAINT MGR1_FK1
    FOREIGN KEY (MID) REFERENCES MANAGER2(MID)
    ON UPDATE CASCADE
    ON DELETE SET NULL,
    ADD CONSTRAINT MGR1_FK2
    FOREIGN KEY (CID) REFERENCES MANAGER3(CID)
    ON UPDATE CASCADE
    ON DELETE SET NULL;
```

Table2:

```
CREATE TABLE CEO1(
    MID INT,
    DID INT,
    PRIMARY KEY (MID,DID)
);

CREATE TABLE CEO2(
    DID INT PRIMARY KEY,
    DIRECTOR VARCHAR(10),
    RESPONSIBILITY VARCHAR(15)
);

ALTER TABLE CEO1
    ADD CONSTRAINT CEO1_FK1
    FOREIGN KEY (DID) REFERENCES CEO2(DID)
    ON UPDATE CASCADE
    ON DELETE SET NULL;
```

task2.2

SQL1:

```
SELECT DISTINCT DIRECTOR FROM CEO2 AS C1
WHERE C1.DID IN
      (SELECT DID FROM CEO1 AS C2
      GROUP BY C2.DID
      HAVING COUNT(*)>=2)
```

SQL2:

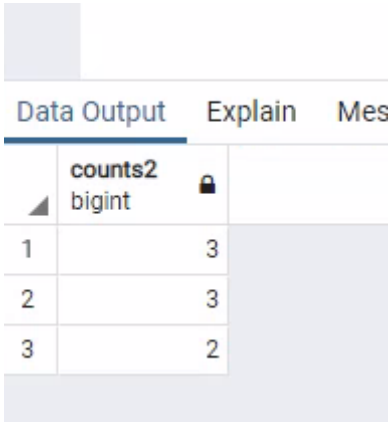
```
SELECT DISTINCT RESPONSIBILITY
FROM CEO2 AS C1
WHERE
    (SELECT COUNT(DISTINCT DID)
    FROM CEO2
    WHERE
        RESPONSIBILITY =C1.RESPONSIBILITY
        GROUP BY  RESPONSIBILITY)
    =
    (SELECT MAX(COUNTS)FROM
        (SELECT COUNT(DISTINCT DID) AS COUNTS
        FROM CEO2
        GROUP BY  RESPONSIBILITY)AS C2)
```

用狗做实验：

实验1：

```
SELECT COUNT(DISTINCT dogid) AS COUNTS2
    FROM attendance as at1
    GROUP BY  showname
    order by counts2 desc
```

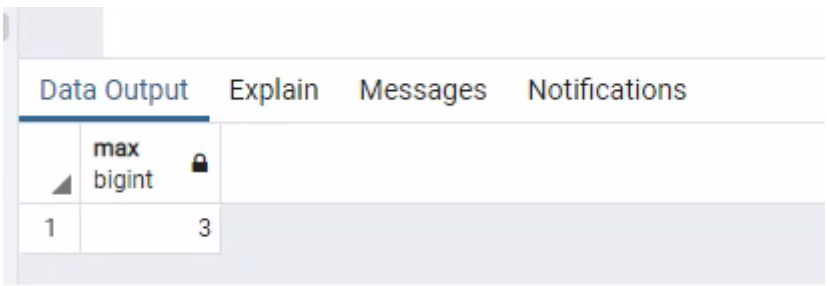
结果：



实验2：

```
SELECT  max(COUNTS)from
    (SELECT COUNT(DISTINCT dogid) AS COUNTS
    FROM attendance
    GROUP BY  showname
    order by counts desc)AS C1
```

结果：

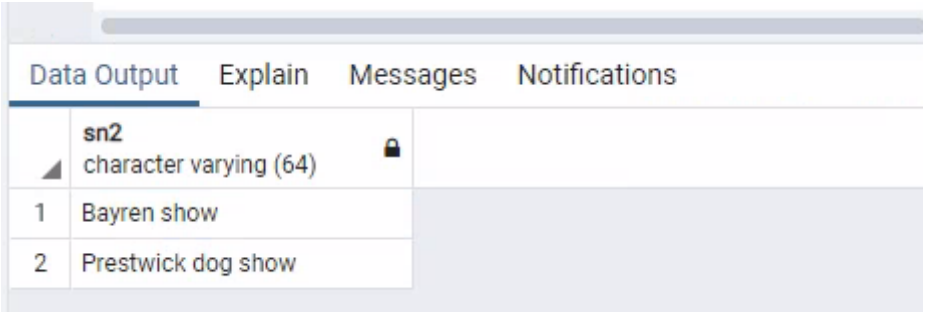


实验3：

```
select distinct showname as sn2 from attendance as a1
where

(SELECT COUNT(DISTINCT dogid) AS COUNTS2
    FROM attendance as at1
 where showname =a1.showname
    GROUP BY  showname
    order by counts2 desc)
    =
(SELECT  max(COUNTS)from
    (SELECT COUNT(DISTINCT dogid) AS COUNTS
    FROM attendance
    GROUP BY  showname
    order by counts desc)AS C1)
```

结果：




```
INSERT INTO ATTENDANCE VALUES ( 3,  'Prestwick dog show',  '30-05-2004',  1);
INSERT INTO ATTENDANCE VALUES ( 5,  'Prestwick dog show',  '30-05-2004',  2);
INSERT INTO ATTENDANCE VALUES ( 7,  'Prestwick dog show',  '30-05-2004',  3);
INSERT INTO ATTENDANCE VALUES ( 3,  'Bayren show',  '12-11-2006',  1);
INSERT INTO ATTENDANCE VALUES ( 11,  'Bayren show',  '12-11-2006',  2);
INSERT INTO ATTENDANCE VALUES ( 12,  'Bayren show',  '12-11-2006',  3);
INSERT INTO ATTENDANCE VALUES ( 11,  'Canine club show',  '09-08-2005',  2);
INSERT INTO ATTENDANCE VALUES ( 4,  'Canine club show',  '09-08-2005',  1);
```

SQL3:

```
```