RDBMS –assignment 3

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This assignment is continue of assignment-1

Step-1

Normalization-

1NF (First Normal Form) Rules

- Each table cell should contain a single value.
- Each record needs to be unique.

2NF (Second Normal Form) Rules

- Rule 1- Be in 1NF
- Rule 2- Single Column Primary Key

3NF (Third Normal Form) Rules

- Rule 1- Be in 2NF
- Rule 2- Has no transitive functional dependencies

Normalization for all logical table begins here

Normalization for table Professor

Prof_ID	Name	Age	Rank	Research_Speciality	Works for Dep_Num

Here considering Prof_ID is primary key

Prof_ID -> defines Name
Prof_ID -> defines Age
Prof_ID -> defines Rank
Prof_ID -> defies Research_Speciality
Prof_ID ->defines Works from Dep_Num

Hence Prof_ID is Primary Key

The table is satisfying below NF

"1NF – Identify Primary Key and no multiple composite values in one attribute"

- Yes it is satisfying 1NF
- Every attribute is atomic and directly defined by PK(Prof_ID)

2NF – Remove partial FD attribute"

- Yes it is satisfying 2NF.
- There are no partial FD attributes

"3NF – Remove transit FD attribute"

- Yes it is satisfying 3NF.

- There are no transit FD attributes

Normalization for table Project

Proj_Num	Sponsor_ name	Start_Date	End_Date	Budget	Managed by Prof_ID

Here considering Proj_Num is primary key

Proj_Num -> defines Sponsor_ name
Proj_Num -> defines Start_Date
Proj_Num -> defines End_Date
Proj_Num -> defines Budget
Proj_Num -> defines Managed by Prof_ID

Hence Proj_Num is Primary Key

The table is satisfying below NF
"1NF – Identify Primary Key and no multiple composite values in one attribute"
- Yes it is satisfying 1NF
- Every attribute is atomic and directly defined by PK(Proj_Num)

2NF – Remove partial FD attribute"
- Yes it is satisfying 2NF.
- There are no partial FD attributes

"3NF – Remove transit FD attribute"
- Yes it is satisfying 3NF.
- There are no transit FD attributes

Normalization for table Department

Dept_Num	Dept_name	Main_office_address	Managed by Prof_ID

Here considering Dept_Num is primary key

Dept_Num -> defines Dept_Name
Dept_Num -> defines Main_Office_Address
Dept_Num -> defines Managed by Prof_ID

Hence Dept_Num is Primary Key

The table is satisfying below NF
"1NF – Identify Primary Key and no multiple composite values in one attribute"
- Yes it is satisfying 1NF
- Every attribute is atomic and directly defined by PK(Dept_Num)

2NF – Remove partial FD attribute"

- Yes it is satisfying 2NF.
- There are no partial FD attributes

"3NF – Remove transit FD attribute"

- Yes it is satisfying 3NF.
- There are no transit FD attributes

Normalization for table Grad_stud

USN	Advisor	Name	Age	Degree_Programe	Working for Dept_num

Here considering USN is primary key

USN <- defines Advisor
USN <- defines Name
USN <- defines Age
USN <- defines Degree program
USN <- defines working for dept_num

Hence USN is Primary Key

The table is satisfying below NF

"1NF – Identify Primary Key and no multiple composite values in one attribute"

- Yes it is satisfying 1NF
- Every attribute is atomic and directly defined by PK(Dept_Num)

2NF – Remove partial FD attribute"

- Yes it is satisfying 2NF.
- There are no partial FD attributes

"3NF – Remove transit FD attribute"

- Yes it is satisfying 3NF.
- There are no transit FD attributes

Normalization for table Supervise

USN	PROJ_ID	SUPERVISED_BY_PROF_ID

Here, this table is inter related to 3 tables namely Grad_Stud, Professors and Project. So the attributes of supervise table are together to form a Primary Key know as Composite Primary Key.

The table is satisfying below NF

"1NF – Identify Primary Key and no multiple composite values in one attribute"

- Yes it is satisfying 1NF,
- Every attribute is atomic and have composite PK by combination of USN from Student table, Proj_Num from Projects and Prof_ID from Professors as one table

"2NF – Remove partial FD attribute"

- Yes it is satisfying 2NF.
- There are no partial FD attributes

"3NF – Remove transit FD attribute"

- Yes it is satisfying 3NF.
- There are no transit FD attributes

Normalization for table PETF (Professors Executes the Projects)

Prof_ID	Executes the Project

Here, this table is inter related to 2 tables namely Professors and Project. So the attributes of PETP table are together to form a Primary Key know as Composite Primary Key.

The table is satisfying below NF

"1NF – Identify Primary Key and no multiple composite values in one attribute"

- Yes it is satisfying 1NF,
- Every attribute is atomic and have composite PK by combination of Prof_ID from Professor table, Proj_Num from Projects as one table

"2NF – Remove partial FD attribute"

- Yes it is satisfying 2NF.
- There are no partial FD attributes

"3NF – Remove transit FD attribute"

- Yes it is satisfying 3NF.
- There are no transit FD attributes

Normalization for all logical table ends here

Step-2 Creating the tables and inserting data

Table – Professors

CREATE TABLE PROFESSORS (
P_ID VARCHAR(8),
NAME VARCHAR(15),
AGE NUMBER (2),
RANK NUMBER (2),
R_S VARCHAR(25),
W_F_DN VARCHAR(8),
CONSTRAINTS PK_PID PRIMARY KEY (P_ID));

W_F_DN BECOMES FK TO DEPARMENT

ALTER TABLE PROFESSORS
ADD CONSTRAINT FK_PROF1 FOREIGN KEY (W_F_DN) REFERENCES DEPARTMENT (D_ID) ON DELETE SET NULL;

Table – Departments

Table – Projects

CREATE TABLE PROJECTS (
P_NUM VARCHAR(8),
SPONECR_NAME VARCHAR(15),
START_DATE DATE NOT NULL,
END_DATE DATE NOT NULL,
BUDGET NUMBER(10),
M_PID VARCHAR(8),
CONSTRAINT PK_PNUM PRIMARY KEY (P_NUM));

M_PID BECOMES FK TO PROFESSORS

ALTER TABLE PROJECTS
ADD CONSTRAINT FK_PROJ1 FOREIGN KEY (M_PID) REFERENCES PROFESSORS (P_ID) ONE DELETE SET NULL;

Table – Grad_stud

```
CREATE TABLE GRAD_STUD (
  USN VARCHAR(8),
  NAME VARCHAR(15),
  AGE NUMBER(2),
  DEGREE_PROG VARCHAR(15),
  ADVISOR VARCHAR(8),
  W_DNUM VARCHAR(8),
  CONSTRAINT PK_USN PRIMARY KEY (USN),
  CONSTRAINT PK_FK_USN FOREIGN KEY (ADVISOR) REFERENCES GRAD_STUD (USN) ON DELETE SET
NULL
);

W_DNUM BECOMES FK TO DEPARTMENT
ALTER TABLE GRAD_STUD
ADD CONSTRAINT FK_GS1 FOREIGN KEY (W_DNUM) REFERENCES DEPARTMENT (D_ID) ON DELETE
SET NUL
```

Table – Supervise

```
CREATE TABLE SUPERVISE (

USN VARCHAR(8),
P_NUM VARCHAR(8),
P_ID VARCHAR(8),
CONSTRAINT PK_SUP PRIMARY KEY (USN,P_NUM,P_ID));

ALTER TABLE SUPERVISE
ADD CONSTRAINT FK_S1 FOREIGN KEY (USN) REFERENCES GRAD_STUD (USN) ON DELETE SET NULL;
ALTER TABLE SUPERVISE
ADD CONSTRAINT PK_S2 FOREIGN KEY (P_NUM) REFERENCES PROJECTS (P_NUM) ON DELETE SET
NULL;
ALTER TABLE SUPERVISE
ADD CONSTRAINT PK_S3 FOREIGN KEY (P_ID) REFERENCES PROFESSORS (P_ID) ON DELETE SET NULL;
```

Table – PETF (Professors Executes the Projects)

```
CREATE TABLE PETP (
  P_ID VARCHAR(8),
  EXE_PNUM VARCHAR(8),
CONSTRAINTS   PK_PIDPNUM PRIMARY KEY (P_ID, EXE_PNUM) );

ALTER TABLE PETP
ADD CONSTRAINT FK_PETP1 FOREIGN KEY (P_ID) REFERENCES PROFESSORS (P_ID) ON DELETE SET
NULL;
ALTER TABLE PETP
CONSTRAINT FK_PETP2 FOREIGN KEY (EXE_PNUM) REFERENCES PROJECTS (P_NUM) ON DELETE SET
NULL;



INSERT INTO PROFESSORS  (P_ID,NAME,AGE,R_S) VALUES ('001','TONY',25,'MATH');
INSERT INTO PROFESSORS  (P_ID,NAME,AGE,R_S) VALUES ('002','PETER',25,'MATH');
INSERT INTO PROFESSORS  (P_ID,NAME,AGE,R_S) VALUES ('003','ROGERS',25,'MATH');
INSERT INTO PROFESSORS  (P_ID,NAME,AGE,R_S) VALUES ('004','THOR',25,'MATH');
INSERT INTO PROFESSORS  (P_ID,NAME,AGE,R_S) VALUES ('005','BANNER',25,'MATH');
INSERT INTO PROFESSORS  (P_ID,NAME,AGE,R_S) VALUES ('007','HESWORTH',25,'MATH');


INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET) VALUES
('A1','ROBERT','01-JAN-2017','01-JAN-2027',100000000)
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET) VALUES
('B2','CHRIS','01-FEB-2017','01-NOV-2027',10000);
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET) VALUES
('C1','PRATT','01-MAR-2017','01-DEC-2027',90000);
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET) VALUES
('D1','JHON','01-APR-2017','01-DEC-2022',100000);
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET) VALUES
('E1','STANK','01-MAY-2017','01-FEB-2027',1000);


INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET,M_PID ) VALUES
('F2','FINNY','01-FEB-2017','01-NOV-2027',12345,'001');
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET,M_PID ) VALUES
('G2','CHACKO','01-FEB-2017','01-NOV-2027',11223,'002');
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET,M_PID ) VALUES
('H2','RUSSEL','01-FEB-2017','01-NOV-2027',99556,'003');
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET,M_PID ) VALUES
('I2','TOM','01-FEB-2017','01-NOV-2027',67890,'004');
INSERT INTO PROJECTS (P_NUM,SPONECR_NAME,START_DATE,END_DATE,BUDGET,M_PID ) VALUES
('K2','CRUIS','01-FEB-2017','01-NOV-2027',98765,'005');


INSERT INTO DEPARTMENT (D_ID,D_NAME,MAIN_ADDR) VALUES ('D1','R DEPT','BANGALORE');
INSERT INTO DEPARTMENT (D_ID,D_NAME,MAIN_ADDR) VALUES ('D2','DBMS DEPT','BANGALORE');
INSERT INTO DEPARTMENT (D_ID,D_NAME,MAIN_ADDR) VALUES ('D3','STAT DEPT','BANGALORE');
INSERT INTO DEPARTMENT (D_ID,D_NAME,MAIN_ADDR) VALUES ('D4','EDA DEPT','BANGALORE');
```

```
INSERT INTO DEPARTMENT (D_ID,D_NAME,MAIN_ADDR) VALUES ('D5','ML DEPT','BANGALORE');
INSERT INTO DEPARTMENT (D_ID,D_NAME,MAIN_ADDR) VALUES ('D6','DL DEPT','BANGALORE');


INSERT INTO GRAD_STUD (USN,NAME,AGE,DEGREE_PROG,W_DNUM) VALUES ('A1','JINNY',18,'DATA
ANALY','D1');
INSERT INTO GRAD_STUD (USN,NAME,AGE,DEGREE_PROG,W_DNUM) VALUES
('A2','OBAMA',19,'DATA SCI','D2');
INSERT INTO GRAD_STUD (USN,NAME,AGE,DEGREE_PROG,W_DNUM) VALUES
('A3','TRUMP',18,'DATA ANALY','D3');
INSERT INTO GRAD_STUD (USN,NAME,AGE,DEGREE_PROG,W_DNUM) VALUES
('A4','MODI',19,'DATA SCI','D4');
INSERT INTO GRAD_STUD (USN,NAME,AGE,DEGREE_PROG,W_DNUM) VALUES
('A5','PUTIN',18,'DATA ANALY','D5'


INSERT INTO PETP (P_ID,EXE_PNUM) VALUES ('001','A1')
INSERT INTO PETP (P_ID,EXE_PNUM) VALUES ('002','B2');
INSERT INTO PETP (P_ID,EXE_PNUM) VALUES ('003','C1');
INSERT INTO PETP (P_ID,EXE_PNUM) VALUES ('004','D1');
INSERT INTO PETP (P_ID,EXE_PNUM) VALUES ('005','E1');


INSERT INTO SUPERVISE (USN,P_NUM,P_ID) VALUES ('A1','A1','001');
INSERT INTO SUPERVISE (USN,P_NUM,P_ID) VALUES ('A1','A1','007');
INSERT INTO SUPERVISE (USN,P_NUM,P_ID) VALUES ('A2','B2','002');
INSERT INTO SUPERVISE (USN,P_NUM,P_ID) VALUES ('A3','C1','003');
INSERT INTO SUPERVISE (USN,P_NUM,P_ID) VALUES ('A4','D1','004');
INSERT INTO SUPERVISE (USN,P_NUM) VALUES ('A5','E1');


UPDATE PROFESSORS SET W_F_DN = 'D1'WHERE P_ID = '001';
UPDATE PROFESSORS SET W_F_DN = 'D2'WHERE P_ID = '002';
UPDATE PROFESSORS SET W_F_DN = 'D3'WHERE P_ID = '003';
UPDATE PROFESSORS SET W_F_DN = 'D4'WHERE P_ID = '004';
UPDATE PROFESSORS SET W_F_DN = 'D5'WHERE P_ID = '005';

UPDATE PROFESSORS SET RANK = 1 WHERE P_ID = '001';
UPDATE PROFESSORS SET RANK = 2 WHERE P_ID = '002';
UPDATE PROFESSORS SET RANK = 3 WHERE P_ID = '003';
UPDATE PROFESSORS SET RANK = 4 WHERE P_ID = '004';
UPDATE PROFESSORS SET RANK = 5 WHERE P_ID = '005';


UPDATE PROJECTS SET M_PID = '001' WHERE P_NUM = 'A1'
UPDATE PROJECTS SET M_PID = '002' WHERE P_NUM = 'B2';
UPDATE PROJECTS SET M_PID = '003' WHERE P_NUM = 'C1';
UPDATE PROJECTS SET M_PID = '004' WHERE P_NUM = 'D1';
UPDATE PROJECTS SET M_PID = '005' WHERE P_NUM = 'E1';


UPDATE DEPARTMENT SET M_PID = '001' WHERE D_ID = 'D1';
UPDATE DEPARTMENT SET M_PID = '002' WHERE D_ID = 'D2';
```

```
UPDATE DEPARTMENT SET M_PID = '003' WHERE D_ID = 'D3';
UPDATE DEPARTMENT SET M_PID = '004' WHERE D_ID = 'D4';
UPDATE DEPARTMENT SET M_PID = '005' WHERE D_ID = 'D5';


UPDATE GRAD_STUD SET ADVISOR = 'A1' WHERE USN ='A2';
UPDATE GRAD_STUD SET ADVISOR = 'A1' WHERE USN ='A3';
UPDATE GRAD_STUD SET ADVISOR = 'A1' WHERE USN ='A4';
UPDATE GRAD_STUD SET ADVISOR = 'A1' WHERE USN ='A5';
UPDATE SUPERVISE SET P_ID ='001' WHERE USN ='A1';
```

SQL> SELECT * FROM PROFESSORS;

```
P_ID    NAME              AGE      RANK R_S                  W_F_DN
-------- --------------- ---------- ---------- ------------------------ --------
001     TONY              25        1 MATH                 D1
002     PETER             25        2 MATH                 D2
003     ROGERS             25        3 MATH                 D3
004     THOR              25        4 MATH                 D4
005     BANNER             25        5 MATH                 D5
007     HESWORTH            25          MATH
008     RAGHU              42          MATH                 D1
```

SQL> SELECT * FROM PROJECTS;

```
P_NUM   SPONECR_NAME   START_DAT END_DATE     BUDGET M_PID
-------- --------------- --------- --------- ---------- --------
A1      ROBERT         01-JAN-17 01-JAN-27  100000000 001
B2      CHRIS          01-FEB-17 01-NOV-27      10000 002
C1      PRATT          01-MAR-17 01-DEC-27      90000 003
D1      JHON           01-APR-17 01-DEC-22     100000 004
E1      STANK          01-MAY-17 01-FEB-27       1000 005
F2      FINNY          01-FEB-17 01-NOV-27      12345 001
G2      CHACKO         01-FEB-17 01-NOV-27      11223 002
H2      RUSSEL         01-FEB-17 01-NOV-27      99556 003
K2      CRUIS          01-FEB-17 01-NOV-27      98765 005
I2      TOM            01-FEB-17 01-NOV-27      67890 004
```

SQL> SELECT * FROM DEPARTMENT;

```
D_ID    D_NAME         MAIN_ADDR          M_PID
-------- --------------- -------------------- --------
D1      R DEPT         BANGALORE          001
D2      DBMS DEPT      BANGALORE           002
D3      STAT DEPT      BANGALORE           003
D4      EDA DEPT       BANGALORE           004
D5      ML DEPT        BANGALORE           005
D6      DL DEPT        BANGALORE
```

SQL> SELECT * FROM GRAD_STUD;

USN	NAME	AGE	DEGREE_PROG	ADVISOR	W_DNUM
A1	JINNY	18	DATA ANALY		D1
A2	OBAMA	19	DATA SCI	A1	D2
A3	TRUMP	18	DATA ANALY	A1	D3
A4	MODI	19	DATA SCI	A1	D4
A5	PUTIN	18	DATA ANALY	A1	D5

SQL> SELECT * FROM PETP;

P_ID	EXE_PNUM
001	A1
002	B2
003	C1
004	D1
005	E1

SQL> SELECT * FROM SUPERVISE;

USN	P_NUM	P_ID
A1	A1	001
A1	A1	007
A1	B2	008
A2	B2	002
A3	C1	003
A4	D1	004

Step-3 Answer the following queries:

a) Retrieve the ids and names of all professors who do not have an ongoing project of more than 1 lakh.

ANS

SQL> SELECT P.P_ID,P.NAME ,PP.BUDGET FROM PROFESSORS P, PROJECTS PP
2 WHERE PP.M_PID = P.P_ID AND PP.BUDGET < 100000;

```
SQL> SELECT P.P_ID,P.NAME ,PP.BUDGET FROM PROFESSORS P, PROJECTS PP
  2  WHERE PP.M_PID = P.P_ID AND PP.BUDGET < 100000;

P_ID     NAME                BUDGET
-------- --------------- ----------
002      PETER                10000
003      ROGERS               90000
005      BANNER                1000
001      TONY                 12345
002      PETER                11223
003      ROGERS               99556
005      BANNER               98765
004      THOR                 67890

8 rows selected.
```

b) Retrieve the names of all graduate students along with their senor graduate student and the professors under whom they work for.

ANS

SQL> SELECT GS.NAME,GS.USN,GS.ADVISOR,GS1.NAME,P.NAME FROM PROFESSORS P,SUPERVISE S,GRAD_STUD GS,GRAD_STUD GS1
2 WHERE S.USN = GS.USN AND S.P_ID = P.P_ID AND GS.ADVISOR = GS1.USN AND S.P_ID IS NOT NULL;

```
SQL> SELECT GS.NAME,GS.USN,GS.ADVISOR,GS1.NAME,P.NAME FROM PROFESSORS  P,SUPERVISE S,GRAD_STUD GS,GRAD_STUD GS1
  2  WHERE S.USN = GS.USN AND S.P_ID  = P.P_ID AND GS.ADVISOR = GS1.USN  AND S.P_ID IS NOT NULL;

NAME            USN      ADVISOR  NAME            NAME
--------------- -------- -------- --------------- ---------------
OBAMA           A2       A1       JINNY           PETER
TRUMP           A3       A1       JINNY           ROGERS
MODI            A4       A1       JINNY           THOR
```

c) List the professors and the sum of their total budgeted projects.

ANS

```
SQL> SELECT P.P_ID,SUM(PP.BUDGET) FROM PROFESSORS P, PROJECTS PP
  2  WHERE PP.M_PID = P.P_ID GROUP BY P.P_ID;
```

```
SQL> SELECT P.P_ID,SUM(PP.BUDGET) FROM PROFESSORS P, PROJECTS PP
  2  WHERE PP.M_PID = P.P_ID GROUP BY P.P_ID;

P_ID     SUM(PP.BUDGET)
-------- --------------
005               99765
004              167890
002               21223
001           100012345
003              189556
```

d) Retrieve the ids and names of project assistants who have more than two professors as supervisors and one of the supervisor is the director.

ANS

```
SQL> SELECT G.USN,  G.NAME, P.NAME,D.D_ID,D.D_NAME FROM GRAD_STUD G, PROFESSORS
P, SUPERVISE S, DEPARTMENT D
 2      WHERE G.USN = S.USN AND P.P_ID = S.P_ID AND D.M_PID  = P.P_ID AND
 3      G.USN IN (SELECT USN FROM SUPERVISE WHERE USN IN
 4      (
 5      SELECT USN FROM SUPERVISE GROUP BY USN HAVING COUNT(P_ID) > 2)
 6      AND
 7      P_ID IN
 8      (
 9      SELECT P.P_ID FROM PROFESSORS P WHERE P_ID IN
10       (
11       SELECT M_PID FROM DEPARTMENT)));
```

```
SQL> SELECT G.USN,  G.NAME, P.NAME,D.D_ID,D.D_NAME FROM GRAD_STUD G, PROFESSORS P, SUPERVISE S, DEPARTMENT D
  2       WHERE G.USN = S.USN AND P.P_ID = S.P_ID AND D.M_PID  = P.P_ID AND
  3       G.USN IN (SELECT USN FROM SUPERVISE WHERE USN IN
  4       (
  5       SELECT USN FROM SUPERVISE GROUP BY USN HAVING COUNT(P_ID) > 2)
  6       AND
  7       P_ID IN
  8       (
  9       SELECT P.P_ID FROM PROFESSORS P WHERE P_ID IN
 10       (
 11       SELECT M_PID FROM DEPARTMENT)));

USN      NAME            NAME            D_ID     D_NAME
-------- --------------- --------------- -------- ---------------
A1       JINNY           TONY            D1       R DEPT
```

e) List the ids, names of professors who have a total worth of project greater than the average budget of projects sanctioned.

ANS

```
SQL> SELECT P.P_ID,P.NAME,PP.P_NUM,PP.BUDGET FROM PROFESSORS P, PROJECTS PP
  2  WHERE PP.M_PID = P.P_ID AND PP.BUDGET > (SELECT AVG(PP.BUDGET) FROM
PROJECTS PP);
```

```
SQL> SELECT P.P_ID,P.NAME,PP.P_NUM,PP.BUDGET FROM PROFESSORS P, PROJECTS PP
  2  WHERE PP.M_PID = P.P_ID AND PP.BUDGET > (SELECT AVG(PP.BUDGET) FROM PROJECTS PP);

P_ID     NAME            P_NUM        BUDGET
-------- --------------- -------- ----------
001      TONY            A1        100000000
```