Database Management Systems Lab

Assignment 2: Database Design - SQL REPORT

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This report contains the detailed relational schema of all the tables along with the description of each table . Further , it is also included with the queries to obtain the result of questions given .

Also the $ Symbol used in the relational algebra formulae (later on in this report) as a substitute to the symbol for natural join .

Table structure

1.Student Table

Attributes :
1. Roll number (Primary Key) varchar
2. name varchar
3. department

Definition

```
CREATE table student(
roll VARCHAR(50) PRIMARY KEY,
name VARCHAR(50),
department VARCHAR(50)
);
```

2.Role

Attributes :
1. r_id (Primary key) int
2. name varchar
3. description varchar

Definition

```
CREATE table role(
r_id SERIAL PRIMARY KEY,
name VARCHAR(50),
```

```
description VARCHAR(255)
);
```

3.Event

Attributes :
1. e_id (Primary key) int
2. name varchar
3. type varchar
4. data DATE

Definition

```
CREATE table event(
e_id SERIAL PRIMARY KEY,
name VARCHAR(50),
type VARCHAR(50),
date DATE
);
```

4.College

Attributes :
1. c_id (Primary key) int
2. name varchar
3. location varchar

Definition

```
CREATE table college(
c_id SERIAL PRIMARY KEY,
name VARCHAR(50),
location VARCHAR(50)
);
```

5.Participant

Attributes :
1. p_id (Primary key) int
2. name varchar
3. college_id (foreign key college(c_id))

Definition

```
CREATE table participant(
p_id SERIAL PRIMARY KEY,
name VARCHAR(50),
college_id INTEGER REFERENCES college(c_id)
);
```

6.Volunteer

Attributes :
1. v_id (Primary key) int
2. roll (foreign key student(roll))

Definition

```
CREATE table volunteer(
v_id SERIAL PRIMARY KEY,
roll VARCHAR(50) REFERENCES student(roll)
);
```

Relationship Tables

1.has_vol

Attributes :
1. e_id (Foreign key event(e_id))
2. v_id (Foreign key volunteer(v_id))

Definition

```
CREATE table has_vol(
e_id INTEGER REFERENCES event(e_id),
v_id INTEGER REFERENCES volunteer(v_id)
);
```

2.has_part

Attributes :
1. e_id (Foreign key event(e_id))
2. p_id (Foreign key participant(p_id))

Definition

```
CREATE table has_part(
e_id INTEGER REFERENCES event(e_id),
p_id INTEGER REFERENCES participant(p_id)
);
```

3.has_role

Attributes :
1. s_id (Foreign key student(roll))
2. r_id (Foreign key role(r_id))

Definition

```
CREATE table has_role(
s_id VARCHAR REFERENCES student(roll),
r_id INTEGER REFERENCES role(r_id)
);
```

4.Manages

Attributes :
1. s_id (Foreign key student(roll))
2. e_id (Foreign key event(e_id))

Definition

```
CREATE table manages(
s_id VARCHAR REFERENCES student(roll),
e_id INTEGER REFERENCES event(e_id)
);
```

Inserting Data

1.Student Table

```
INSERT INTO student(roll,name,department) VALUES('21CS10001','Abhiram','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10002','Abhishek','Mathematics');
INSERT INTO student(roll,name,department) VALUES('21CS10003','Rahul','Mechanical');
INSERT INTO student(roll,name,department) VALUES('21CS10004','Tony','Electrical');
INSERT INTO student(roll,name,department) VALUES('21CS10005','Steve','Civil');
INSERT INTO student(roll,name,department) VALUES('21CS10006','Bruce','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10007','Natasha','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10008','Clint','Mathematics');
INSERT INTO student(roll,name,department) VALUES('21CS10009','Thor','Mechanical');
INSERT INTO student(roll,name,department) VALUES('21CS10010','Loki','Electrical');
INSERT INTO student(roll,name,department) VALUES('21CS10011','Peter','Civil');
INSERT INTO student(roll,name,department) VALUES('21CS10012','Wanda','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10013','Vision','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10014','Sam','Mathematics');
INSERT INTO student(roll,name,department) VALUES('21CS10015','Bucky','Mechanical');
INSERT INTO student(roll,name,department) VALUES('21CS10016','Scott','Electrical');
INSERT INTO student(roll,name,department) VALUES('21CS10017','Stephen','Civil');
INSERT INTO student(roll,name,department) VALUES('21CS10018','TChalla','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10019','Gamora','CSE');
INSERT INTO student(roll,name,department) VALUES('21CS10020','Groot','Mathematics');
INSERT INTO student(roll,name,department) VALUES('21CS10021','Rocket','Mechanical');
INSERT INTO student(roll,name,department) VALUES('21CS10022','Drax','Electrical');
INSERT INTO student(roll,name,department) VALUES('21CS10023','Mantis','Civil');
INSERT INTO student(roll,name,department) VALUES('21CS10024','Nebula','CSE');
```

2.Role

```
INSERT INTO role(name,description) VALUES('Secretary','Secretary work');
INSERT INTO role(name,description) VALUES('admin','Administrative work');
INSERT INTO role(name,description) VALUES('Accountant','Accounting work');
INSERT INTO role(name,description) VALUES('Accomodation','Arranging accomodation');
INSERT INTO role(name,description) VALUES('Catering','Arranging food');
INSERT INTO role(name,description) VALUES('Security','Security work');
INSERT INTO role(name,description) VALUES('Transport','Transportation work');
INSERT INTO role(name,description) VALUES('Audio/Video','Audio/Video setup');
INSERT INTO role(name,description) VALUES('Decoration','Decoration work');
INSERT INTO role(name,description) VALUES('Photography','Photography work');
```

3.Event

```
INSERT INTO event(name,type,date) VALUES('Megaevent','Megaevent','2021-10-10');
INSERT INTO event(name,type,date) VALUES('Drone racing','Competition','2021-10-10');
INSERT INTO event(name,type,date) VALUES('Robo soccer','Competition','2021-10-11');
INSERT INTO event(name,type,date) VALUES('CODENITE','Competition','2021-10-12');
INSERT INTO event(name,type,date) VALUES('Talk on Mental Health','Guest Lecture','2021-10-
12');
INSERT INTO event(name,type,date) VALUES('Talk on Entrepreneurship','Guest Lecture','2021-10-
13');
INSERT INTO event(name,type,date) VALUES('Talk on AI','Guest Lecture','2021-10-14');
INSERT INTO event(name,type,date) VALUES('Modern Art','Exhibition','2021-10-15');
INSERT INTO event(name,type,date) VALUES('Photography','Exhibition','2021-10-16');
INSERT INTO event(name,type,date) VALUES('Painting','Exhibition','2021-10-17');
INSERT INTO event(name,type,date) VALUES('Dance','Cultural','2021-10-18');
INSERT INTO event(name,type,date) VALUES('Music','Cultural','2021-10-19');
INSERT INTO event(name,type,date) VALUES('Drama','Cultural','2021-10-20');
INSERT INTO event(name,type,date) VALUES('Fashion Show','Cultural','2021-10-21');
INSERT INTO event(name,type,date) VALUES('Martin Garix Show','Concert','2021-10-21');
INSERT INTO event(name,type,date) VALUES('KSHMR Show','Concert','2021-10-22');
```

4.College

```
INSERT INTO college(name,location) VALUES('IIT Kharagpur','Kharagpur');
INSERT INTO college(name,location) VALUES('IIT Bombay','Mumbai');
INSERT INTO college(name,location) VALUES('IIT Delhi','Delhi');
INSERT INTO college(name,location) VALUES('IIT Kanpur','Kanpur');
INSERT INTO college(name,location) VALUES('IIT Madras','Chennai');
INSERT INTO college(name,location) VALUES('IIT Guwahati','Guwahati');
```

5.Participant

```
INSERT INTO participant(name,college_id) VALUES('Tony Stark',1);
INSERT INTO participant(name,college_id) VALUES('Steve Rogers',2);
INSERT INTO participant(name,college_id) VALUES('Bruce Banner',3);
INSERT INTO participant(name,college_id) VALUES('Natasha Romanoff',4);
INSERT INTO participant(name,college_id) VALUES('Clint Barton',5);
INSERT INTO participant(name,college_id) VALUES('Thor Odinson',6);
INSERT INTO participant(name,college_id) VALUES('Loki Laufeyson',1);
INSERT INTO participant(name,college_id) VALUES('Peter Parker',2);
```

```
INSERT INTO participant(name,college_id) VALUES('Wanda Maximoff',3);
INSERT INTO participant(name,college_id) VALUES('Vision',4);
INSERT INTO participant(name,college_id) VALUES('Sam Wilson',5);
INSERT INTO participant(name,college_id) VALUES('Bucky Barnes',6);
INSERT INTO participant(name,college_id) VALUES('Scott Lang',1);
INSERT INTO participant(name,college_id) VALUES('Stephen Strange',2);
INSERT INTO participant(name,college_id) VALUES('TChalla',3);
INSERT INTO participant(name,college_id) VALUES('Gamora',4);
INSERT INTO participant(name,college_id) VALUES('Groot',5);
INSERT INTO participant(name,college_id) VALUES('Rocket',6);
INSERT INTO participant(name,college_id) VALUES('Drax',1);
INSERT INTO participant(name,college_id) VALUES('Mantis',2);
INSERT INTO participant(name,college_id) VALUES('Nebula',3);
INSERT INTO participant(name,college_id) VALUES('Salah',4);
INSERT INTO participant(name,college_id) VALUES('Mane',5);
INSERT INTO participant(name,college_id) VALUES('Firmino',6);
INSERT INTO participant(name,college_id) VALUES('Henderson',1);
INSERT INTO participant(name,college_id) VALUES('Van Dijk',2);
INSERT INTO participant(name,college_id) VALUES('Alisson',3);
INSERT INTO participant(name,college_id) VALUES('Fabinho',4);
INSERT INTO participant(name,college_id) VALUES('Robertson',5);
INSERT INTO participant(name,college_id) VALUES('Alexander-Arnold',2);
```

6.Volunteer

```
INSERT INTO volunteer(roll) VALUES('21CS10001');
INSERT INTO volunteer(roll) VALUES('21CS10002');
INSERT INTO volunteer(roll) VALUES('21CS10003');
INSERT INTO volunteer(roll) VALUES('21CS10004');
INSERT INTO volunteer(roll) VALUES('21CS10005');
INSERT INTO volunteer(roll) VALUES('21CS10006');
```

7.has_vol

```
INSERT INTO has_vol(e_id,v_id) VALUES(1,1);
INSERT INTO has_vol(e_id,v_id) VALUES(1,2);
INSERT INTO has_vol(e_id,v_id) VALUES(1,3);
INSERT INTO has_vol(e_id,v_id) VALUES(2,4);
INSERT INTO has_vol(e_id,v_id) VALUES(2,5);
INSERT INTO has_vol(e_id,v_id) VALUES(2,6);
INSERT INTO has_vol(e_id,v_id) VALUES(3,1);
INSERT INTO has_vol(e_id,v_id) VALUES(3,2);
INSERT INTO has_vol(e_id,v_id) VALUES(4,3);
INSERT INTO has_vol(e_id,v_id) VALUES(4,4);
INSERT INTO has_vol(e_id,v_id) VALUES(4,5);
```

8.has_part

```
INSERT INTO has_part(e_id,p_id) VALUES(1,1);
INSERT INTO has_part(e_id,p_id) VALUES(2,2);
INSERT INTO has_part(e_id,p_id) VALUES(3,3);
INSERT INTO has_part(e_id,p_id) VALUES(4,4);
```

```
INSERT INTO has_part(e_id,p_id) VALUES(5,5);
INSERT INTO has_part(e_id,p_id) VALUES(6,6);
INSERT INTO has_part(e_id,p_id) VALUES(7,7);
INSERT INTO has_part(e_id,p_id) VALUES(8,8);
INSERT INTO has_part(e_id,p_id) VALUES(9,9);
INSERT INTO has_part(e_id,p_id) VALUES(10,10);
INSERT INTO has_part(e_id,p_id) VALUES(11,11);
INSERT INTO has_part(e_id,p_id) VALUES(12,12);
INSERT INTO has_part(e_id,p_id) VALUES(13,13);
INSERT INTO has_part(e_id,p_id) VALUES(14,14);
INSERT INTO has_part(e_id,p_id) VALUES(1,15);
INSERT INTO has_part(e_id,p_id) VALUES(2,16);
INSERT INTO has_part(e_id,p_id) VALUES(3,17);
INSERT INTO has_part(e_id,p_id) VALUES(4,18);
INSERT INTO has_part(e_id,p_id) VALUES(5,19);
INSERT INTO has_part(e_id,p_id) VALUES(6,20);
INSERT INTO has_part(e_id,p_id) VALUES(1,21);
INSERT INTO has_part(e_id,p_id) VALUES(2,22);
INSERT INTO has_part(e_id,p_id) VALUES(3,23);
INSERT INTO has_part(e_id,p_id) VALUES(1,24);
INSERT INTO has_part(e_id,p_id) VALUES(4,8);
INSERT INTO has_part(e_id,p_id) VALUES(1,8);
```

9.has_role

```
INSERT INTO has_role(s_id,r_id) VALUES('21CS10001',1);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10002',2);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10003',3);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10004',4);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10005',5);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10006',6);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10007',7);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10008',8);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10009',9);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10010',10);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10011',11);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10012',12);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10013',13);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10014',14);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10015',15);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10016',16);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10017',1);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10018',2);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10019',3);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10020',4);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10021',5);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10022',6);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10023',7);
INSERT INTO has_role(s_id,r_id) VALUES('21CS10024',8);
```

10.Manages

```
INSERT INTO manages(s_id,e_id) VALUES('21CS10001',1);
INSERT INTO manages(s_id,e_id) VALUES('21CS10021',2);
```

```
INSERT INTO manages(s_id,e_id) VALUES('21CS10003',3);
INSERT INTO manages(s_id,e_id) VALUES('21CS10020',4);
INSERT INTO manages(s_id,e_id) VALUES('21CS10005',5);
INSERT INTO manages(s_id,e_id) VALUES('21CS10019',6);
INSERT INTO manages(s_id,e_id) VALUES('21CS10007',7);
INSERT INTO manages(s_id,e_id) VALUES('21CS10017',8);
INSERT INTO manages(s_id,e_id) VALUES('21CS10009',9);
INSERT INTO manages(s_id,e_id) VALUES('21CS10015',10);
INSERT INTO manages(s_id,e_id) VALUES('21CS10011',11);
INSERT INTO manages(s_id,e_id) VALUES('21CS10013',12);
INSERT INTO manages(s_id,e_id) VALUES('21CS10023',13);
INSERT INTO manages(s_id,e_id) VALUES('21CS10024',14);
INSERT INTO manages(s_id,e_id) VALUES('21CS10016',15);
INSERT INTO manages(s_id,e_id) VALUES('21CS10018',16);
INSERT INTO manages(s_id,e_id) VALUES('21CS10022',1);
INSERT INTO manages(s_id,e_id) VALUES('21CS10002',2);
INSERT INTO manages(s_id,e_id) VALUES('21CS10004',3);
INSERT INTO manages(s_id,e_id) VALUES('21CS10006',4);
INSERT INTO manages(s_id,e_id) VALUES('21CS10008',5);
INSERT INTO manages(s_id,e_id) VALUES('21CS10010',6);
INSERT INTO manages(s_id,e_id) VALUES('21CS10012',7);
INSERT INTO manages(s_id,e_id) VALUES('21CS10014',8);
```

Queries to Questions

a) Roll number and name of all the students who are managing the “Megaevent”

```
SELECT student.roll ,student.name from student
join manages on student.roll = manages.s_id
join event on manages.e_id = event.e_id
where event.name = 'Megaevent';
```

Relational Algebra :

$\pi_{student.roll,student.name}(\sigma_{event.name='Megaevent'}$ ((student $\$_{student.roll=manages.roll}$ manages) $\$_{manages.e\_id=event.e\_id}$ event))

Output :

```
   roll    |  name
-----------+---------
 21CS10001 | Abhiram
 21CS10022 | Drax
(2 rows)
```

b)Roll number and name of all the students who are managing “Megaevent” as a “Secretary”

```
SELECT student.roll,student.name from student
join manages on student.roll = manages.s_id
join event on manages.e_id = event.e_id
join has_role on student.roll = has_role.s_id
```

```
join role on has_role.r_id = role.r_id
where event.name = 'Megaevent' and role.name = 'Secretary';
```

Relational Algebra :

$\pi_{student.roll,student.name}$ (σ $_{event.name='Megaevent' \wedge role.name='Secretary'}$ ((((student $ $_{student.roll = manages.roll}$ manages) $ $_{manages.e\_id = event.e\_id}$ event) $ $_{student.roll = has\_roll.s\_id}$ has_role) $ $_{has\text{-}role.r\_id = role.r\_id}$ role))

Output:

```
   roll    |  name
-----------+---------
 21CS10001 | Abhiram
 (1 row)
```

c)Name of all the participants from college "IIT Bombay" in "Megaevent"

```
SELECT name from participant as T where T.p_id in
(select p_id from has_part where e_id in
(select e_id from event where name='Megaevent')) and T.college_id in
(select c_id from college where name='IIT Bombay');
```

Relational Algebra :

A <- π_{c_id}(σ $_{name = 'IIT Bombay'}$(college))

B <- π_{e_id}(σ $_{name = 'Megaevent'}$(event))

C <- π_{p_id}(σ $_{e\_id = B.e\_id}$(has_part))

π_{name}(σ $_{p\_id = C.p\_id \wedge college\_id = A.c\_id}$(participant))

Output :

```
     name
--------------
 Peter Parker
 (1 row)
```

d)Name of all colleges who have at least one participant in "Megaevent"

```
select college.name from college
join participant on college.c_id = participant.college_id
join has_part on participant.p_id = has_part.p_id
join event on has_part.e_id = event.e_id
where event.name = 'Megaevent'
GROUP BY college.name;
```

Relational Algebra :

$\pi_{college.name}$(σ $_{event.name = 'Megaevent'}$(((college $ $_{college.c\_id=participant.c\_id}$ participant) $ $_{participant.p\_id = has\_part.p\_id}$ has_part) $ $_{has\_part.e\_id = event.e\_id}$ event))

Output :

```
     name
---------------
 IIT Bombay
 IIT Delhi
 IIT Guwahati
 IIT Kharagpur
(4 rows)
```

e) Name of the events which is managed by Secretary

```
select event.name from event,manages,student,has_role,role where event.e_id = manages.e_id and
manages.s_id = student.roll and student.roll=has_role.s_id and has_role.r_id = role.r_id and
role.name ='Secretary' ;
```

Relational Algebra :

$\pi_{event.name}$ (σ role.name = 'Secretary' ^ event.e_id = manges.e_id ^ manages.s_id = student.roll ^ student.roll = has_roll.s_id ^ has_role.r_id = role_r_id(event x manages x student x has_role x role))

Output :

```
    name
------------
 Megaevent
 Modern Art
(2 rows)
```

f) Name of all the “CSE” department student volunteers of “Megaevent”

```
select student.name from student,volunteer,has_vol,event where student.roll = volunteer.roll
and volunteer.v_id = has_vol.v_id and has_vol.e_id = event.e_id and event.name ='Megaevent'
and student.department ='CSE' ;
```

Relational Algebra :

$\pi_{student.name}$ (σ student.roll=volunteer.roll ^ volunteer.v_id=has_vol.v_id ^ has_vol.e_id = event.e_id ^ event.name = 'Megaevent' ^ student.department = 'CSE'(student x volunteer x has_vol x event))

Output :

```
  name
---------
 Abhiram
(1 row)
```

g) Name of all the events which has at least one volunteer from “CSE”

```
select event.name from event,volunteer,has_vol,student where event.e_id = has_vol.e_id and
has_vol.v_id = volunteer.v_id and volunteer.roll = student.roll and student.department ='CSE'
```

```
;
```

Relational Algebra :

$\pi_{event.name}(\sigma$ event.e_id = has_vol.e_id ^ has_vol.v_id = volunteer.v_id ^ volunteer.roll = student.roll ^ student.department = $'CSE'$(event x volunteer x has_vol x student))

Output:

```
     name
--------------
 Megaevent
 Drone racing
 Robo soccer
(3 rows)
```

h) Name of the college with the largest number of participants in “Megaevent”

```
select college.name , count(participant.p_id) from college
join participant on college.c_id = participant.college_id
join has_part on participant.p_id = has_part.p_id
join event on has_part.e_id = event.e_id
where event.name = 'Megaevent'
GROUP BY college.name
ORDER BY count(participant.p_id) DESC LIMIT 1;
```

Relational Algebra :

$\pi_{college.name,count(participant.p_id)}(\sigma$ event.name = 'Megaevent'(((college $ college.c_id = participant.college_id participant) $ participant.p_id = has_part.p_id has_part)$ has_part.e_id = event.e_id event))

Output:

```
   name    | count
-----------+-------
 IIT Delhi |     2
(1 row)
```

i)Name of the college with largest number of participant over all

```
select college.name
from participant
JOIN college on participant.college_id = college.c_id
GROUP BY college.name
ORDER BY count(participant.name) DESC LIMIT 1;
```

Relational Algebra :

$\pi_{college.name}(\sigma$ (participant $ participant.college_id = college.c_id college))

Output:

```
    name
------------
 IIT Bombay
(1 row)
```

j) Name of the department with the largest number of volunteers in all the events which has at least one partcipant from “IITB”

```
select student.department from student
join volunteer on student.roll = volunteer.roll
join manages on student.roll = manages.s_id
where manages.e_id in
(
select event.e_id from event
join has_part on event.e_id = has_part.e_id
join participant on has_part.p_id = participant.p_id
join college on participant.college_id = college.c_id
where college.name = 'IIT Bombay'
)
GROUP BY student.department
ORDER BY count(manages.e_id) DESC LIMIT 1;
```

Relational Algebra :

$B \leftarrow \pi_{event.e\_id}(\sigma_{college.name = 'IIT\ Bombay'}(((event \$_{event.e\_id = has\_part.e\_id} has\_part) \$_{has\_part.p\_id = particpant.p\_id} participant) \$_{participant.college\_id = college.c\_id} college))$

$\pi_{student.department}(\sigma_{manages.e\_id = B.e\_id}((student \$_{student.roll = volunteer.roll} volunteer) \$_{student.roll = manages.s\_id} manages))$

Output :

```
 department
------------
 CSE
(1 row)
```