1. Schema

A) ENTITIES

```
Student (
   Roll INT PRIMARY KEY,
   name VARCHAR(255),
   Dept VARCHAR(255)
);

Role (
   RID INT PRIMARY KEY,
   Rname VARCHAR(255),
   Description VARCHAR(255)
);

Event (
   EID INT PRIMARY KEY,
   Date DATE,
   EName VARCHAR(255),
   Type VARCHAR(255)
);

Volunteer (
   Roll INT PRIMARY KEY,
   FOREIGN KEY (Roll) REFERENCES Student(Roll)
);
```

```
Participant (
   PID INT PRIMARY KEY,
   Name VARCHAR(255),
   CollegeName VARCHAR(255),
   FOREIGN KEY (CollegeName) REFERENCES College(Name)          -- The Participant-College relation is incorporated here
);

College (
   Name VARCHAR(255) PRIMARY KEY,
   Location VARCHAR(255)
);
```

B) RELATIONSHIPS

```
StudentRole (
   Roll INT,
   RID INT,
   PRIMARY KEY (Roll, RID),
   FOREIGN KEY (Roll) REFERENCES Student(Roll),
   FOREIGN KEY (RID) REFERENCES Role(RID)
);

EventManager (
   EID INT,
   Roll INT,
```

```
  PRIMARY KEY (EID, Roll),
  FOREIGN KEY (EID) REFERENCES Event(EID),
  FOREIGN KEY (Roll) REFERENCES Student(Roll)
);

EventParticipant (
  EID INT,
  PID INT,
  PRIMARY KEY (EID, PID),
  FOREIGN KEY (EID) REFERENCES Event(EID),
  FOREIGN KEY (PID) REFERENCES Participant(PID)
);

EventVolunteer (
  EID INT,
  Roll INT,
  PRIMARY KEY (EID, Roll),
  FOREIGN KEY (EID) REFERENCES Event(EID),
  FOREIGN KEY (Roll) REFERENCES Volunteer(Roll)
);
```

2. **Commands Used**

CREATE TABLE used to create tables in the database.

INSERT INTO used to add records into the different tables.

SELECT combined with commands like ‘JOIN’, ‘WHERE’, ‘GROUP BY’, ‘ORDER BY’ and ‘DISTINCT’ to retrieve data as per requirements.

‘FOREIGN KEY’ used to ensure data integrity and clearly defining the relationships between tables.

3. **Records Inserted**

- Student

roll	name	dept
1	Krish	CSE
2	Sahil	EE
3	Sammy	MA
4	Bob	PH
5	Aubrey	EC
6	Anita	ME
7	Maxx	CSE
8	Wynn	EE
9	Symere	PH
10	Matt	EC

- Role

rid	rname	description
1	Admin	Administrator role
2	Staff	Staff role
3	Student	Student role
4	Secretary	Secretary role
5	Head	Head role

- Event

eid	date	ename	type
101	2024-01-04	Megaevent	Concert
102	2024-01-04	Workshop Z	Workshop
103	2024-01-03	Seminar C	Seminar
104	2024-01-02	Hackathon D	Hackathon
105	2024-01-01	Exhibition A	Exhibition

- Volunteer

roll
1
2
4
6
8

- College

name	location
IITB	Powai
IITKGP	Kharagpur
VIT	Vellore
BITS	Dubai
VJTI	Mumbai

- Participant

pid	name	collegename
101	Participant A	IITB
102	Participant B	IITKGP
103	Participant C	VIT
104	Participant D	VIT
105	Participant E	BITS

- StudentRole

roll	rid
1	4
2	2
3	3
4	1
5	5

- EventManager

eid	roll
101	1
102	2
103	3
101	4
105	5

- EventParticipant

eid	pid
101	101
102	102
103	103
104	104
105	105

- EventVolunteer

eid	roll
101	1
101	2
103	6
104	4
105	8

4. **Results of Queries**

1.

$\pi_{Student.roll,Student.name}$ ($\sigma_{Event.EName='Megaevent'}$ (Student⋈EventManager⋈Event))

roll	name
1	Krish
4	Bob

2.

$\pi_{Student.roll,Student.name}$ ($\sigma_{Event.EName='Megaevent' \text{ and } Role.Rname='Secretary'}$ (Student⋈EventManager⋈Event⋈StudentRole⋈Role))

roll	name
1	Krish

3.

$\pi_{Participant.Name}$ ($\sigma_{College.Name='IITB' \text{ and } Event.EName='Megaevent'}$ (Participant ⋈EventParticipant⋈Event⋈College))

name
Participant A

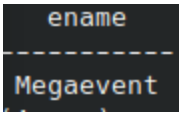
4.

$\pi_{College.Name}$ ($\sigma_{Event.EName='Megaevent'}$ (College⋈Participant⋈EventParticipant⋈Event))

name
IITB

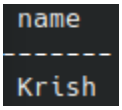
5.

$\pi_{Event.EName}$ ($\sigma_{Role.Rname='Secretary'}$ (StudentRole⋈Role⋈EventManager⋈Event))



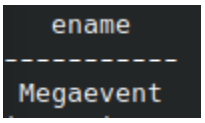
6.

$\pi_{Student.name}$ ($\sigma_{Student.dept='CSE'\ and\ Event.EName='Megaevent'}$ (Student⋈Volunteer⋈EventVolunteer⋈Event))



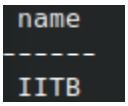
7.

$\pi_{Event.EName}$ ($\sigma_{Student.dept='CSE'}$ (Student⋈Volunteer⋈EventVolunteer⋈Event))



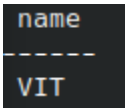
8.

$\pi_{College.Name}$ ($\sigma_{Event.EName='Megaevent'}$ (College⋈Participant⋈EventParticipant⋈Event)) ↠ (COUNT(Participant.PID), DESC) ↠ LIMIT 1



9.

$\pi_{College.Name}$ (σ(Participant⋈College)) ↠ (COUNT(Participant.PID), DESC) ↠ LIMIT 1



10.

$\pi_{Student.dept}$ (γMAX(count) ($\sigma_{College.Name='IITB'}$(Student⋈Volunteer⋈EventVolunteer⋈Event⋈EventParticipant⋈Participant⋈College))) ↠ GROUP BY Student.dept ↠ ORDER BY COUNT(DISTINCT Volunteer.roll) DESC ↠ LIMIT 1

```
dept
------
CSE
```