Database Systems (CSPE-25 and ITPC-25

List of Experiments

Experiment No.- 01

Focus: To learn installation.

Installation of MYSQL/ ORACLE (Refer Video Tutorial)
http://www.spoken-tutorial.org/
Show Video from link http://www.spoken-tutorial.org/keyword-search/?q=SQL

Experiment No.- 02

Focus: Create tables and insert tuples.

Create tables and insert tuples in the databases described by the following relational schemas.

a) CAR (Registration-No, Chassis-No, Engine-No, Company-Name, Model, Year-Model, Price)
PERSON (Aadhar-No, Name, Address, City)
OWN-BY (Registration-No, Aadhar-No)
DRIVER (License-No., Date-of-Issue, Valid-up-to, Aadhar-No.)

b) STUDENT (Roll-No., Name, Father-Name, Mother-Name, City, Dept-Code)
DEPARTMENT (Dept-Code, Dept-Name, Dept-Head)
PROGRAM (Degree-Name, Discipline-Name)
ENROLLED (Roll-No., Degree-Name)

c) COMPANY (C-Registration-No, C-Name, Address)
PERSON (Aadhar-No, Name, Father-Name, Date-of-Birth, Address)
OWNED-BY (C-Registration-No, Aadhar-No)

d) BOOK (Access-No., Title, Author, Subject-Code)
MEMBER (Membership-No., Type)
EMPLOYEE (Emp-Code, Name, Designation, Dept-Name)
STUDENT (Roll-No., Dept-Name, Program)
BOOKS-ISSUE (Register-Entry-No., Access-No., Membership-No., Date-of-Issue)
BOOKS-RETURN (Access-No., Return-Date, Comment)

Experiment No.- 03

Focus Area: Tables and various Key Constraints

In Computer Engineering department, projects are assigned to the students. Design a database to maintain data related to the students, projects, guides and project assigned to different groups of the students. The explanation of the scenario is as under:

A group of the students has minimum three students; however, a group can also have four students with the prior permission of the HOD. The teachers have their different subject areas in which they prefer to guide projects. A teacher can supervise maximum three projects in a semester. Consider appropriate attribute types for entity/relation types keeping in view terminology used in the department.

Create a database for the following relational schema and insert tuples.

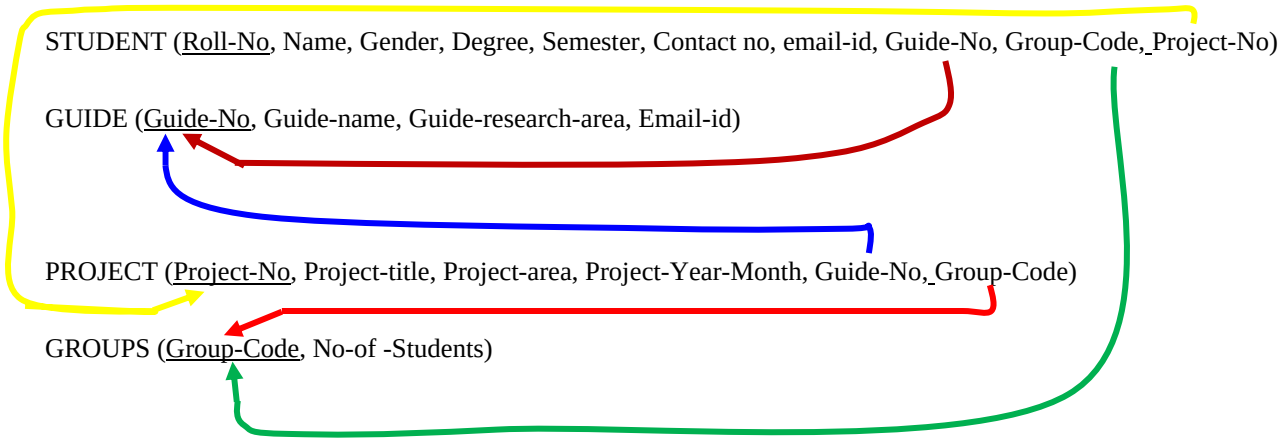
STUDENT (Roll-No, Name, Gender, Degree, Semester, Contact no, email-id, Guide-No, Group-Code, Project-No)

GUIDE (Guide-No, Guide-name, Guide-research-area, Email-id)

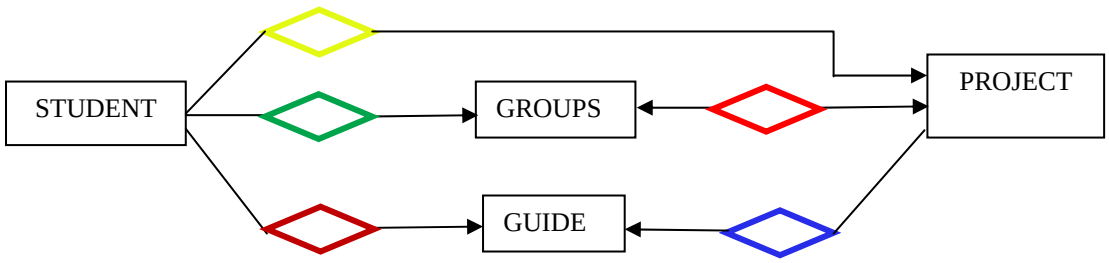
PROJECT (Project-No, Project-title, Project-area, Project-Year-Month, Guide-No, Group-Code)

GROUPS (Group-Code, No-of -Students)

Relational schema exhibiting foreign keys is as under:



ER schema exhibiting entity types and their relationships:



Add the following constraints on the attributes of the tables:

(1). Add Integer data type for the attribute *Roll-No* of the table Student.
(2). Add a constraint Check on the attribute *Gender* of the table Student such that the attribute will able to accept only ('M','F') values.
(3). Add a constraint on the attribute *Degree* of the table Student such that no null values could be inserted in it.
(4). Add appropriate temporal data type for the attribute *Project-Year-Month.*

Write following SQL queries for the database:

(1). Update details of the guide of the student whose Roll-no is '110011'. The details of the new guide are as Guide-name ='Ram Mohan' & Guide-No = '11'.
(2). Remove Guide details where Guide-No is '15' and assign a new guide with Guide-No '10' to all the students who were earlier assigned to the guide with Guide-No '15'.
(3). Get a list of guides who are guiding more than two groups of students.
(4). Get a list of Project-No, Project-title, and names of guides who are guiding projects in the Project area 'Database'.
(5). Get title of the Project-No '5'.
(6). Get names of all the students of the project no. '5'.
(7). List all the projects being guided by 'Dr. S K Jain'.
(8). Get names of all the students being guided by 'Dr. S K Jain'.
(9). List all the projects completed on 'June 2019'.
(10). List all the projects completed in year '2019'.
(11). Lists roll numbers and names of all the students who have their projects in Project area "Programming".
(12). List names of all the teachers who are guiding projects to the students in the Project area "Network".
(13). List names of all the students who have their projects in the Project area "Artificial Intelligence".
(14). List names of the guides with their Project areas.
(15). Whether Project-No '7' was guided by 'Dr. S K Jain' in 'Dec 2020'.
(16). List names of the students of the groups code 'G3'.
(17). Retrieve name of the guide of the group 'G5'.
(18). Retrieve group-codes of the students whose guide is 'Dr. S K Jain'.

Experiment No. 04

Focus: To learn different types of joins.

Create the following tables and insert tuples

Department

DeptName	**Manager**
Sales	Ram
Finance	Sita
Accounts	Rohit
Inventory	Gatgi
Office	Mohit

Employee

EmpID	**Name**	**DeptName**
1101	Ramesh	Sales
2241	Suresh	Finance
2242	Kamal	Sales
2243	Ankur	Inventory
2244	Vikas	Office
2245	Amir	Sales

Students can add more tuples in table Employee.

Using SQL statements perform following join operations on the above tables Employee and Department:

1. Cartesian product
2. Natural join
3. Left outer join
4. Right outer join
5. Full outer join
6. Left semi-join
7. Right semi-join

Schema for a University Database

Create a relational database for a University described by the following relational schema and populate it by tuples.

CLASSROOM (Building, Room Number, capacity)

DEPARTMENT (Dept name, building, budget)

COURSE (Course id, title, dept name, credits)

INSTRUCTER (I-ID, name, dept name, salary)

SECTION (Course id, sec id, semester, year, building, room number, time slot id)

TEACHES (I-ID, course id, sec id, semester, year)

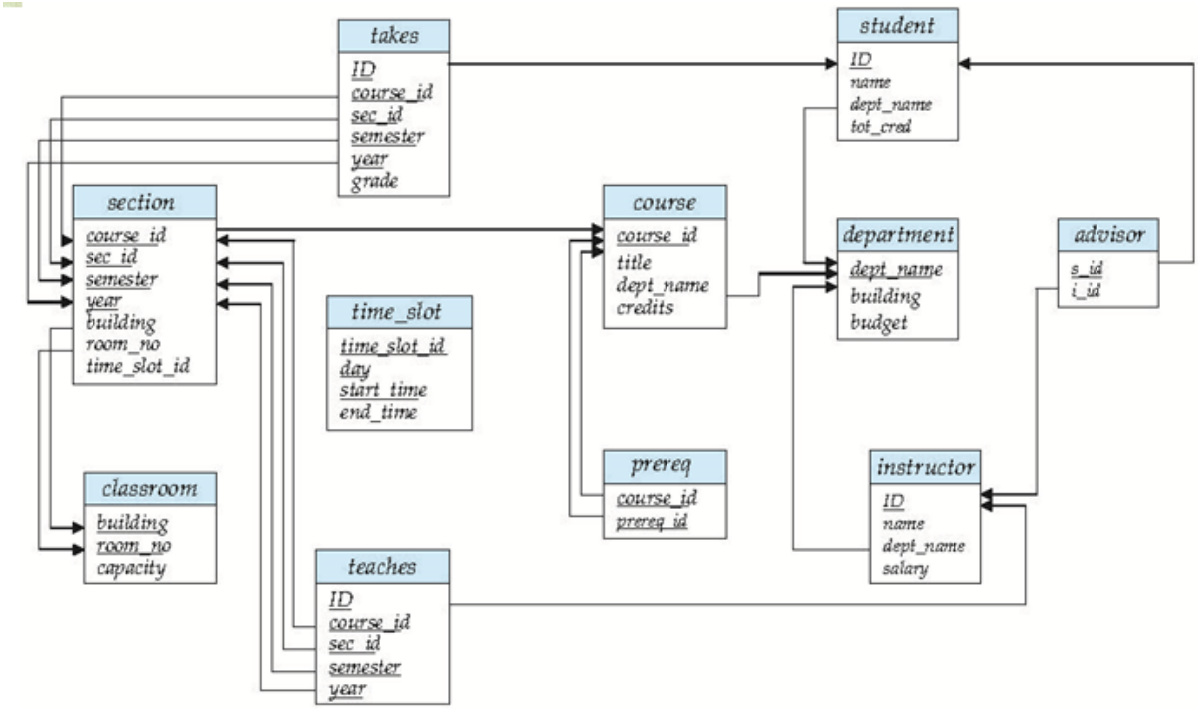
STUDENT (S-ID, name, dept name, tot credit)

TAKES (ID, Course-id, sec-id, semester, year, grade)

ADVISOR (S- ID, I-ID)

TIME SLOT (Time-slot-id, day, start time, end time)

PREREQ (Course-id, Prereq-id)



CLASSROOM (Building, Room Number, capacity)

DEPARTMENT (Dept name, building, budget)

COURSE (Course id, title, dept name, credits)

INSTRUCTER (I-ID, name, dept name, salary)

SECTION (Course id, sec id, semester, year, building, room number, time slot id)

TEACHES (I-ID, course id, sec id, semester, year)

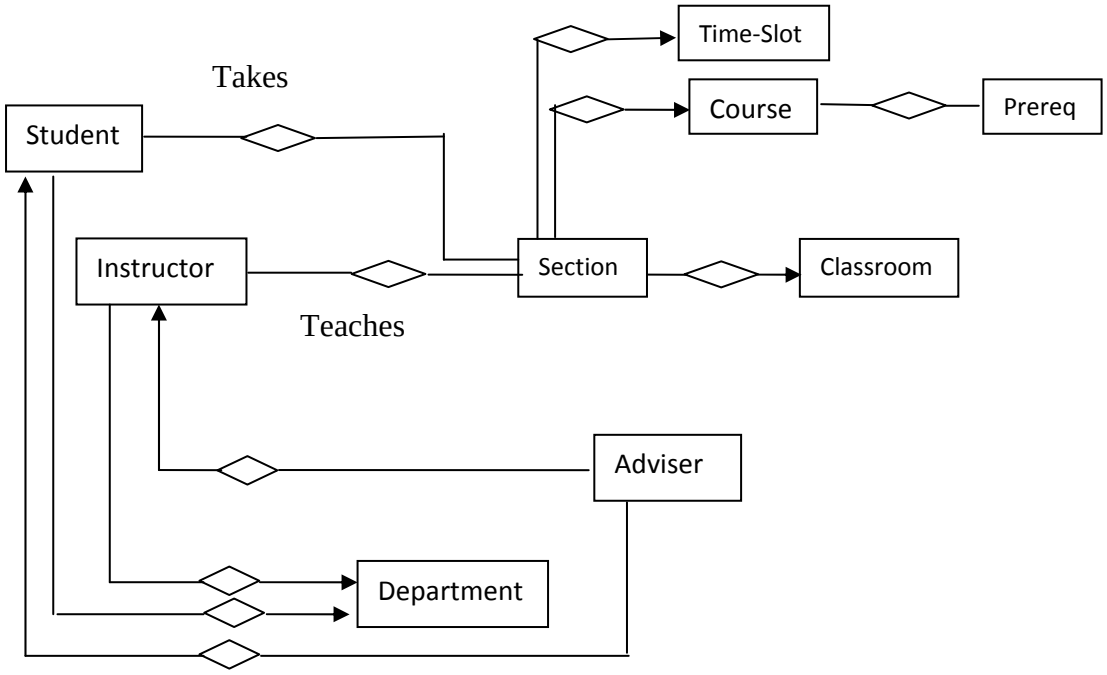
STUDENT (S-ID, name, dept name, tot credit)

TAKES (ID, Course-id, sec-id, semester, year, grade)

ADVISOR (S- ID, I-ID)

TIME SLOT (Time-slot-id, day, start time, end time)

PREREQ (Course-id, Prereq-id)



Experiment No.-05

Write the following queries in the SQL for the above mentioned database of a university.

(update, retrieve, rename)

(1). Increase Salary by 20 percent of all instructors who are working in Department IT.

(2). Retrieve names of all instructors along with their department names.

(3). Retrieve names of all instructors along with their department names and building names in which the departments are housed.

(4). Retrieve names of all departments along with names of the buildings in which they are situated.

(5). Change name of the building "Lecture Hall Complex" to "Lecture Theatre Complex".

(6). Find name of the department of a student with ID _____. (Take a valid ID value of a student)

(7). Retrieve names of all instructors along with the Course IDs of the courses they teach.

(8). Retrieve Course ID, semester, year and title of each course being taught by "Computer Engg." department.

(9). Compute monthly salary of all instructors and display it as 'monthly salary' attribute in place of attribute 'salary'.

(10). Retrieve names of all departments housed in the building named _____. (Consider a valid Building name)

(11). Find the names of all instructors belonging to Computer Engg. department who have salary greater than Rs. 70,000.

(12). Find titles of the courses that have credits 3 and offered by the department IT.

(13). Find course names and their credits running in semester 4.

(14). List classes as year and semester wise engaged in room no. LHC-102.

(15). List classes as year, semester and section wise engaged in room no. LHC-102.

(16). List classes as year, semester and section wise engaged in room no. LHC-101.

(17). Retrieve list of room number & time slot where all classes of Computer Engg.. Semester 7^{th} are scheduled.

(18). Retrieve Course titles taught by instructor _____. (Take a valid instructor ID or name)

(19). For all instructors in the university who have taught some course, display their names along with their department names.

(20). Find the names of all instructors who have a higher salary than some instructor in "Computer Engg." department.

Experiment No.-06

Write the following queries in the SQL for the above mentioned database of a university.

string operation, between, Aggregate, group by

(1). Find names of all departments whose building name includes the substring “Hall”.
(2). Find names of all instructors who have their salaries between Rs. 50,000 and Rs. 80,000.
(3). Find names of all students whose names begin with string "Sa":
(4). Find names of all students belonging to Computer Engg. department and their names begin with character "Sa":
(5). Retrieve list of courses taught by teachers whose names begin with character "S".
(6). Retrieve list of courses beginning their titles with word "Computer".
(7). Retrieve list of courses containing the word "language" in their titles.
(8). Retrieve names of the instructors who teach courses containing word "language" in their titles.
(9). Find IDs of all students whose names include "Kumari" and their department is IT.
(10). Find average salary of all instructors.
(11). Find average salary of the instructors belonging to Computer Engg, department.
(12). Find average salary of the instructors belonging to each department.
(13). Find names and average salaries of all departments whose average salary is greater than Rs. 60000.
(14). Find total number of courses offered by the university.
(15). Find total number of courses offered by the Computer Engg department.
(16). Find total number of courses taught in the Spring 2016 semester.
(17). Find total number of instructors who teach a course in the Spring 2016 semester.
(18). Find maximum salary of an instructor belonging to Computer Engg, department.
(19). Find minimum salary of an instructor belonging to Computer Engg, department.
(20). Find maximum salary of an instructor in the university.
(21). Find total number of students enrolled in the university.
(22). Find total number of students enrolled in each department of the university.
(23). Find instructors whose average salaries are greater than Rs. 42,000.
(24). Find instructors whose average salaries are greater than that of the instructors belonging to the 'Physics' department.
(25). Retrieve total no. of students in each department who earned total credits more than 8.

Experiment No.-07

Write the following queries in the SQL using set operations union, intersect, except, etc. (for the above mentioned database of a university)

set operations,

1. Find courses taught in Fall 2015 or in Spring 2016. (use union operation)
2. Find courses taught in Fall 2015 and in Spring 2016. (use intersect operation)
3. Find courses taught in Fall 2015 but not in Spring 2016. (use except operation)
4. Find courses taught/offered by Computer Engg. department in Fall 2015 or ECE department in Spring 2016. (use union operation)
5. Find courses taught/offered by Computer Engg. department in Fall 2015 and ECE department in Spring 2016. (use intersect operation)
6. Find courses taught/offered by Computer Engg. department in Fall 2015 but not by ECE department in Spring 2016. (use except operation)

Rewrite queries from 1 to 6 including keyword "all" along with set operations to retain duplicates in results.

7. List all instructors of the Physics department in alphabetic order.
8. List all coursed offered by Physics department in alphabetic order.

Making use of sub-queries and "in", "not in" connectives, write queries for the following:

9. Find courses taught in Fall 2015 and in Spring 2016. (sub-query, in)
10. Find courses taught in Fall 2015 but not in Spring 2016. (sub-query, not in)
11. Find courses taught/offered by Computer Engg. department in Fall 2015 and ECE department in Spring 2016. (sub-query, in)
12. Find courses taught/offered by Computer Engg. department in Fall 2015 but not by ECE department in Spring 2016. (sub-query, not in)
13. Find total no. of distinct students who have taken courses taught in different sections by an instructor. (Take a valid instructor ID or name)
14. Find names of instructors with salary greater than that of some (at least one) instructors of the Physics department.
15. Implement the following query and observe the results

```
select name
from instructor
where salary  > some (select salary
                      from instructor
                      where Dept name ="Physics")
```

    Based on the observations of the result, write the query in English language. Give your opinion on any different version of the above query.
16. Find names of all the instructors whose salaries are greater than that of the salaries of all instructors belonging to the Physics department. (sub-query, "all")

17. Using *update* statement and *set* keyword

    "increase salaries of the instructors whose salaries are greater than 50000" by 15%"
    "decrease salaries of the instructors whose salaries are greater than 50000" by 5%"
18. List all departments along with no. of instructors in each department.
19. List all departments along with no. of students in each department.
20. Use a sub-query to derive a relation in "from" clause and write query for the following:
    "Find department names along with average salaries of the instructors of that department where average salaries are greater than Rs. 45000"

    "Retrieve name of department along with no. of students who have earned total credits more than 7"

    "Find name of department along with no. of instructors belonging to the department"

21. List instructor name, dept name, and no. of courses taught by the instructor in Sprint 2016.
22. Retrieve departments that have budget amount more than 5 lacs.
23. Find the names of all students who have taken at least one course taught by Computer Engg. department; make sure there are no duplicate names in the result.

view create, use, drop

Advanced Experiments (Optional to implement)

1. Write a program in a language (C, C++, Java, etc.) to identify functional dependencies between pairs of two attributes in the given table.
2. Write a program in a language (C, C++, Java, etc.) to test whether a functional dependency (take any two attributes in the table) exists or not.

A	**B**	**C**	**D**
a_1	b_1	c_1	d_1
a_1	b_2	c_1	d_2
a_2	b_2	c_2	d_2
a_2	b_3	c_2	d_3
a_3	b_3	c_2	d_4

3. Using a programming language (C, C++, Java, etc.), implement the algorithm for computing closure of F, i.e., F^+. Test the algorithm by taking F as a set of nay two FDs from the table of previous experiment.
4.

Implement algorithm for computing closure of attribute sets.

Implement an algorithm for testing whether an attribute is extraneous in a given functional dependency under a set of FDs holding on a relation schema R.

Implement an algorithm for computing canonical cover.

Include experiments later on Testing lossless decomposition, decomposition of a relation, etc. (to be done by skj)

Experiment No.-09

Create a relational database schema for a Company, described by the following relations and Insert tuples.

Employee (F-name, L-name, Emp-id, Bdate, Address, Gender, Salary, Super-Emp-id, D-no)

Department (D-name, D-no, D-Mgr-id, Mgr-start-date)

Dept-Location(D-no, D-location)

Project (P-name, P-number, P-location, D-no)

Works-on (Emp-id, P-no, Hours)

Dependent (Emp-id, Dependent-name, Gender, Bdate, Relationship)

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse

Specify the following queries in SQL on the database schema **Company**

(1). Company decided to give a raiseon salaries of every employee, working on the ‘ProductX’ project by 10 percent.

(2). Find the names and address of all employees who work on same department.

(3). Retrieve the name & employee no of employees, whose salary is between $30,000 and $40,000.

(4). Find the names of all employees who are directly supervised by ‘Franklin

(5). List the name and address of all employees who work for the ‘Research’ department.

(6). List the names of employees who works on all project controlled by department number 5.

(7). List the names of all employees who have a dependent with the same first name as themselves.

(8). Retrieve the names of all employees in department 5 who work more than 10 hours per week on XYZ Project.

(9). Retrieve a list of employees and the projects they are working on, ordered by department and, within each department, ordered alphabetically by last name, then first name.

Experiment No.-09

Specify the following queries in SQL on the database schema Company

(Experiment no. 08)

(1). Retrieve the employee details, whose first name start with “AB”.

(2). Retrieve the employee details, whose third character of first name “S”.

(3). Retrieve all employees, whose address is in Houston, Texas.

(4). Retrieve the employees, whose supervisor city name start name “NEW”.

(5). Retrieve the project name, whose location pin code consists first 3 digits are “111”.

(6). Retrieve the employee name, Employee id, dept no, project no, whose were born during 1980 and working in a project located at “INDIA”.

(7). Retrieve the total number of Employees in organization.

(8). Count the number of distinct salary values in the Company.

(9). Retrieve the total number of Supervisor in organization.

(10). Retrieve the total no of Female Employee in organization, whose salary is more than 25000.

(11). Retrieve the total number projects currently in company.

(12). Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary.

(13). Retrieve the average salary of all female employees.

(14). Retrieve the Employee id & no of projects, employee is working on.

(15). Retrieve employee id, employee name, total no of hours he works on project

Experiment No.-10

Specify the following queries in SQL on the database schema Company

(Experiment no. 08)

(1). Retrieve the total no male & female employee in the Organization

(2). Retrieve the total no of employee working, for each of the department

(3). For each department, retrieve the department name and the average salary of all employees working in that department.

(4). For each project, retrieve the project number, the project name and the number of employees who work on that project

(5). For each project, list the project name and total no of hours per week (by all employees) spent on the project.

(6). Retrieve the Project name & no of employee,inwhich least number of employees are working.

(7). Retrieve the name of department name & department No, number of projects, who are controlling highest no of projects.

(8). For each project on which more than two employees work, retrieve the project number, the project name, and the number of employees who work on the project.

(9). For each project, retrieve the project number, the project name, and the number of employees from department 1 who work on the project.

(10). For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than $40,000.

(11). Retrieve the names of the employee who do not have supervisors.

(12). Retrieve the names of employees who work on all projects controlled by department No 05.

(13). Find the names of all employees who earn more than average salary of company.

(14). Make a list of project numbers for projects that involve an employee whose last name is ‘Smith’, either as a worker or as a manager of the department that controls the project.

Experiment No.-11

Specify the following queries in SQL on the database schema Company

(Experiment no. 08)

(1). Retrieve the names of all employees who work on every project.

(2). List the last name of all department managers who have no dependent.

(3). List the names of managers who have at least one dependent.

(4). Retrieve the names of employees who do not work on any project

(5). Retrieve the names of employees who work on all projects.

(6). Retrieve the name of department name & department No, number of employees, Number of projects, who is controlling highest no of projects.

(7). List the name of each employee who works on some project controlled by department number 5.

(8). Retrieve the name of department name & department No, number of employees, Number of projects, who is controlling highest no of projects.

(9). A view that has the department name, manager name and manager salary for every department.

(10). A view that has the project name, controlling department, number of employees, and total hours worked per week for each project.

(11). A view that has the project name, controlling department name, number of employees, total hours per week on the project for each project with more than one employee working on it.

Assignment – DB Design

A database is being constructed to keep track of the teams and games of asports league. A team has a number of players, not all of whom participate ineach game. It is desired to keep track of the players participating in eachgame for each team, the positions they played in that game, and the result ofthe game. Design an ER schema diagram for this application, stating anyassumptions you make. Choose your favourite sport (e.g., soccer, baseball,football).

(1). Find the name of Team, who won the maximum number of matches /games.
(2). Retrieve the name of players of each participating team, who played highest number of games (for a team).
(3). Retrieve the name of players of each team, who played on every match in which the team is winning team.
(4). Retrieve the name of venues in which each team won at least a game/match.
(5). Find the name of players for each team in tournament that played at least in three different positions on different games/matches for each team.
(6). Retrieve the Team Name, Player Name, opponent team, player position for all matches where team is losing side.