CSLR51 – Database Management Systems Laboratory
Session 4

Q1

```
mysql> SELECT Fname, Lname FROM EMPLOYEE WHERE Super_ssn IS NULL;
+-------+-------+
| Fname | Lname |
+-------+-------+
| James | Borg  |
+-------+-------+
1 row in set (0.00 sec)

mysql> SELECT DISTINCT Pnumber FROM PROJECT WHERE Pnumber IN (SELECT Pnumber FROM
PROJECT, DEPARTMENT, EMPLOYEE WHERE Dnum = Dnumber AND Mgr_ssn = Ssn AND Lname =
'SMITH') OR Pnumber IN (SELECT Pno FROM WORKS_ON, EMPLOYEE WHERE Essn = Ssn AND
Lname='SMITH');
+---------+
| Pnumber |
+---------+
|       1 |
+---------+
1 row in set (0.00 sec)

mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE AS E WHERE E.Ssn IN (SELECT D.Essn
FROM DEPENDENT AS D WHERE E.Fname = D.Dependent_name AND E.Sex = D.Sex);
Empty set (0.00 sec)

mysql> SELECT Fname, Lname FROM EMPLOYEE WHERE NOT EXISTS(SELECT * FROM
DEPENDENT WHERE Ssn = Essn);
+-------+-------+
| Fname | Lname |
+-------+-------+
| James | Borg  |
+-------+-------+
1 row in set (0.00 sec)

mysql> SELECT Fname, Lname FROM EMPLOYEE WHERE EXISTS(SELECT * FROM DEPENDENT
WHERE Ssn = Essn) AND EXISTS (SELECT * FROM DEPARTMENT WHERE Ssn = Mgr_ssn);
+-------+---------+
| Fname | Lname   |
+-------+---------+
| Joyce | English |
+-------+---------+
1 row in set (0.00 sec)

mysql> SELECT Fname, Lname FROM EMPLOYEE WHERE NOT EXISTS ((SELECT Pnumber FROM
PROJECT WHERE Dnum=5) EXCEPT (SELECT Pno FROM WORKS_ON WHERE Ssn=Essn));
```

```
Empty set (0.00 sec)

mysql> SELECT DISTINCT Essn FROM WORKS_ON WHERE Pno IN (1,2,3);
+-----------+
| Essn      |
+-----------+
| 123456789 |
| 333444555 |
+-----------+
2 rows in set (0.00 sec)

mysql> SELECT E.Lname AS EMPLOYEE_NAME, S.Lname AS SUPERVISOR_NAME FROM
EMPLOYEE AS E, EMPLOYEE AS S WHERE E.Super_ssn=S.Ssn;
+---------------+-----------------+
| EMPLOYEE_NAME | SUPERVISOR_NAME |
+---------------+-----------------+
| Smith         | English         |
| English       | Borg            |
+---------------+-----------------+
2 rows in set (0.00 sec)
mysql> SELECT Fname, Lname, Address FROM (EMPLOYEE JOIN DEPARTMENT ON
Dno=Dnumber) WHERE Dname='Research';
+-------+---------+----------------+
| Fname | Lname   | Address        |
+-------+---------+----------------+
| John  | Smith   | 31, 1ST STREET |
| Joyce | English | 61, 7TH STREET |
+-------+---------+----------------+
2 rows in set (0.00 sec)
mysql> SELECT SUM(Salary), MAX(Salary), MIN(Salary), AVG(Salary) FROM EMPLOYEE;
+-------------+-------------+-------------+--------------+
| SUM(Salary) | MAX(Salary) | MIN(Salary) | AVG(Salary)  |
+-------------+-------------+-------------+--------------+
|   135000.00 |    55000.00 |    35000.00 | 45000.000000 |
+-------------+-------------+-------------+--------------+
1 row in set (0.00 sec)

mysql> SELECT SUM(Salary), MAX(Salary), MIN(Salary), AVG(Salary) FROM (EMPLOYEE JOIN
DEPARTMENT ON Dno=Dnumber) WHERE Dname='Research';
+-------------+-------------+-------------+--------------+
| SUM(Salary) | MAX(Salary) | MIN(Salary) | AVG(Salary)  |
+-------------+-------------+-------------+--------------+
|    80000.00 |    45000.00 |    35000.00 | 40000.000000 |
+-------------+-------------+-------------+--------------+
1 row in set (0.00 sec)

mysql> SELECT COUNT(*) FROM EMPLOYEE;
+----------+
| COUNT(*) |
```

```
+----------+
|      3 |
+----------+
1 row in set (0.00 sec)

mysql> SELECT COUNT(*) FROM EMPLOYEE, DEPARTMENT WHERE Dno=Dnumber AND
Dname='Research';
+----------+
| COUNT(*) |
+----------+
|      2 |
+----------+
1 row in set (0.00 sec)
mysql> SELECT COUNT(DISTINCT SALARY) FROM EMPLOYEE;
+-----------------------+
| COUNT(DISTINCT SALARY) |
+-----------------------+
|                  3 |
+-----------------------+
1 row in set (0.00 sec)
mysql> SELECT Lname, Fname FROM EMPLOYEE WHERE (SELECT COUNT(*) FROM DEPENDENT
WHERE Ssn=Essn)>=2;
+---------+-------+
| Lname   | Fname |
+---------+-------+
| English | Joyce |
+---------+-------+
1 row in set (0.00 sec)

mysql> SELECT Dno, COUNT(*), AVG(Salary) FROM EMPLOYEE GROUP BY Dno;
+-----+----------+--------------+
| Dno | COUNT(*) | AVG(Salary)  |
+-----+----------+--------------+
|   5 |      2 | 40000.000000 |
|   1 |      1 | 55000.000000 |
+-----+----------+--------------+
2 rows in set (0.00 sec)

mysql> SELECT Pnumber, Pname, COUNT(*) FROM PROJECT, WORKS_ON WHERE Pnumber=Pno
GROUP BY Pnumber, Pname;
+---------+-------------+----------+
| Pnumber | Pname       | COUNT(*) |
+---------+-------------+----------+
|     30 | NEWBENEFITS |       1 |
|      1 | PRODUCTX    |       1 |
|      3 | PRODUCTZ    |       1 |
+---------+-------------+----------+
3 rows in set (0.00 sec)
```

Q2

(a)

```
mysql> SELECT D.Dname, COUNT(E.Ssn) AS Num_Employees FROM DEPARTMENT D, EMPLOYEE
E WHERE D.Dnumber = E.Dno GROUP BY
D.Dname HAVING AVG(E.Salary) > 30000;
+----------+---------------+
| Dname    | Num_Employees |
+----------+---------------+
| Research |             2 |
+----------+---------------+
1 row in set (0.00 sec)
```

(b)(i)

```
mysql> SELECT D.Dname, COUNT(E.Ssn) AS Num_Female_Employees FROM DEPARTMENT D,
EMPLOYEE E WHERE D.Dnumber = E.Dno AN
D E.Sex = 'F' AND E.Salary > 30000 GROUP BY D.Dname;
+----------+----------------------+
| Dname    | Num_Female_Employees |
+----------+----------------------+
| Research |                    1 |
+----------+----------------------+
1 row in set (0.00 sec)
```

(b)(ii)

```
mysql> SELECT D.Dname, COUNT(E.Ssn) AS Num_Male_EMPLOYEEs FROM DEPARTMENT D,
EMPLOYEE E WHERE D.Dnumber = E.Dno GROUP BY D.Dname HAVING AVG(E.Salary) > 30000;
+----------+--------------------+
| Dname    | Num_Male_EMPLOYEEs |
+----------+--------------------+
| Research |                  2 |
+----------+--------------------+
1 row in set (0.00 sec)
```

(c)

```
mysql> SELECT E1.Fname, E1.Lname FROM EMPLOYEE E1 WHERE E1.Dno = (SELECT E2.Dno
FROM EMPLOYEE E2 ORDER BY E2.Salary DESC LIMIT 1);
+-------+-------+
| Fname | Lname |
+-------+-------+
| James | Borg  |
+-------+-------+
1 row in set (0.00 sec)
```

(d)

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E WHERE E.Salary >= (SELECT MIN(Salary)
FROM EMPLOYEE) + 10000;
+-------+---------+
| Fname | Lname   |
```

```
+-------+---------+
| Joyce | English |
| James | Borg    |
+-------+---------+
2 rows in set (0.00 sec)
```

(e)

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E, WORKS_ON W WHERE E.Ssn = W.Essn
AND E.Dno = 5 AND W.Hours > 10 AND W.Pno = (SELECT P.Pnumber FROM PROJECT P WHERE
P.Pname = 'ProductX');
+-------+-------+
| Fname | Lname |
+-------+-------+
| John  | Smith |
+-------+-------+
1 row in set (0.00 sec)
```

(f)

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E, DEPENDENT D WHERE E.Ssn = D.Essn
AND E.Fname = D.DEPENDENT_name;
Empty set (0.00 sec)
```

(g) Find the names of all employees who are directly supervised by ‘James Borg’.

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E, EMPLOYEE S WHERE E.Super_ssn = S.Ssn
AND S.Fname = 'James' AND S.Lname = 'Borg';
+-------+-------+
| Fname | Lname |
+-------+-------+
| Joyce | English |
+-------+-------+
1 row in set (0.00 sec)
```

(h) Find the names of employees who work on all the projects controlled by department number 5.

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E WHERE NOT EXISTS ((SELECT Pnumber
FROM PROJECT WHERE Dnum = 5) EXCEPT (SELECT Pno FROM WORKS_ON WHERE Essn =
E.Ssn));
+-------+-------+
| Fname | Lname |
+-------+-------+
| Joyce | English |
+-------+-------+
1 row in set (0.00 sec)
```

(i) For each project, list the project name and the total hours per week (by all employees) spent on that project.

```
mysql> SELECT P.Pname, SUM(W.Hours) AS Total_Hours FROM PROJECT P LEFT JOIN WORKS_ON
W ON P.Pnumber = W.Pno GROUP BY P.Pnumber, P.Pname;
+-------------+-------------+
| Pname      | Total_Hours |
+-------------+-------------+
| PRODUCTX   |       32.5 |
| PRODUCTZ   |       10.0 |
| NEWBENEFITS |      30.0 |
+-------------+-------------+
3 rows in set (0.00 sec)
```

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

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E WHERE NOT EXISTS ((SELECT Pnumber
FROM PROJECT) EXCEPT (SELECT Pno FROM WORKS_ON WHERE Essn = E.Ssn));
Empty set (0.00 sec)
```

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

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E WHERE NOT EXISTS (SELECT * FROM
WORKS_ON WHERE Essn = E.Ssn);
+-------+-------+
| Fname | Lname |
+-------+-------+
| James | Borg  |
+-------+-------+
1 row in set (0.00 sec)
```

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

```
mysql> SELECT AVG(Salary) AS Avg_Female_Salary FROM EMPLOYEE WHERE Sex = 'F';
+-------------------+
| Avg_Female_Salary |
+-------------------+
|       45000.00 |
+-------------------+
1 row in set (0.00 sec)
```

(m) Find the names and addresses of all employees who work on at least one project located in BELLAIRE but whose department has no location in BELLAIRE.

```
mysql> SELECT E.Fname, E.Lname, E.Address FROM EMPLOYEE E WHERE EXISTS (SELECT *
FROM WORKS_ON W, PROJECT P WHERE E.Ssn = W.Essn AND W.Pno = P.Pnumber AND
P.Plocation = 'BELLAIRE') AND NOT EXISTS (SELECT * FROM DEPT_LOCATIONS DL WHERE
DL.Dnumber = E.Dno AND DL.Dlocation = 'BELLAIRE');
+-------+-------+----------------+
| Fname | Lname | Address       |
+-------+-------+----------------+
| Joyce | English | 61, 7TH STREET |
```

```
+-------+-------+----------------+
1 row in set (0.00 sec)
```

(n) List the last names of all department managers who have no dependents.

```
mysql> SELECT DISTINCT E.Lname FROM EMPLOYEE E WHERE E.Ssn IN (SELECT Mgr_ssn FROM
DEPARTMENT) AND NOT EXISTS (SELECT * FROM DEPENDENT D WHERE E.Ssn = D.Essn);
+-------+
| Lname |
+-------+
| Borg  |
+-------+
1 row in set (0.00 sec)
```

(o) Display employee names (e') who are supervised by an e' who is immediately supervised by an employee with Lname 'Borg'.

```
mysql> SELECT E1.Fname, E1.Lname FROM EMPLOYEE E1, EMPLOYEE E2, EMPLOYEE E3 WHERE
E1.Super_ssn = E2.Ssn AND E2.Super_ssn = E3.Ssn AND E3.Lname = 'Borg';
+-------+-------+
| Fname | Lname |
+-------+-------+
| Joyce | English |
+-------+-------+
1 row in set (0.00 sec)
```

(p) Display names of all employees who work on some project controlled by department number 10.

```
mysql> SELECT DISTINCT E.Fname, E.Lname FROM EMPLOYEE E, WORKS_ON W, PROJECT P
WHERE E.Ssn = W.Essn AND W.Pno = P.Pnumber AND P.Dnum = 10;
Empty set (0.00 sec)
```

(q) Print all the ssn and the first name of supervisors who supervise at least 2 projects in ascending order of the number of employees he/she supervises.

```
mysql> SELECT E.Ssn, E.Fname FROM EMPLOYEE E WHERE E.Ssn IN (SELECT S.Super_ssn FROM
EMPLOYEE S, PROJECT P WHERE S.Ssn = P.Dnum GROUP BY S.Super_ssn HAVING
COUNT(DISTINCT P.Pnumber) >= 2) ORDER BY (SELECT COUNT(*) FROM EMPLOYEE WHERE
Super_ssn = E.Ssn);
+-------+-------+
| Ssn   | Fname |
+-------+-------+
| 888777666 | James |
+-------+-------+
1 row in set (0.00 sec)
```

(r) Display all male employee names who also have dependents along with their dependent names.

```
mysql> SELECT E.Fname, E.Lname, D.Dependent_name FROM EMPLOYEE E, DEPENDENT D
WHERE E.Ssn = D.Essn AND E.Sex = 'M';
+-------+---------+-------------+
| Fname | Lname   | Dependent_name |
+-------+---------+-------------+
| John  | Smith   | ELIZABETH     |
+-------+---------+-------------+
1 row in set (0.00 sec)
```

(s) Display those employees whose salary exceeds the department managers salary that the employee(s) work for.

```
mysql> SELECT E.Fname, E.Lname FROM EMPLOYEE E WHERE Salary > (SELECT MAX(E2.Salary)
FROM EMPLOYEE E2, DEPARTMENT D WHERE E.Dno = D.Dnumber AND E2.Ssn = D.Mgr_ssn);
+-------+---------+
| Fname | Lname   |
+-------+---------+
| Joyce | English |
+-------+---------+
1 row in set (0.00 sec)
```

(t) Display employee names who either work in the Research department or supervise an employee working for the Research department.

```
mysql> SELECT DISTINCT E.Fname, E.Lname FROM EMPLOYEE E WHERE E.Dno = (SELECT
Dnumber FROM DEPARTMENT WHERE Dname = 'Research') OR E.Ssn IN (SELECT Super_ssn
FROM EMPLOYEE WHERE Dno = (SELECT Dnumber FROM DEPARTMENT WHERE Dname =
'Research'));
+-------+---------+
| Fname | Lname   |
+-------+---------+
| John  | Smith   |
| Joyce | English |
+-------+---------+
2 rows in set (0.00 sec)
```