2011 Mock Summer Answers [Databases]

1. **Database Concepts and Definition**

   (a) In a relational database, define the term *foreign key*.

   - A foreign constraint key is a referential constraint between two tables. The foreign key identifies a column or set of columns in one(referencing table) that refers to a set of columns in another(referenced) table.

   [2 Marks]

   (b) Identify the foreign keys in the relation WORKS_ON of CompanyDB.

   - ESSN references SSN in EMPLOYEE.
   - PNO references PNUMBER in PROJECT

   (c) [2 Marks]

   (d) Specify how the concept of *referential integrity* is related to that of *foreign key*.

   - If a relation R1, references another relation R2 on attribute x, then every value of x appearing in R1 must also appear in R2.

   [2 Marks]

   ***(d)* Specify the SQL statement that would define the WORKS_ON table, and maintain referential integrity.**

   - CREATE TABLE WORKS_ON
     (ESSN INT(9) NOT NULL, PNO INT(2) NOT NULL, HOURS DECIMAL(2,1),
     FOREIGN KEY(ESSN) REFERENCES EMPLOYEE(SSN),
     FOREIGN KEY(PNO) REFERENCES PROJECT(PNUMBER));

   [4 Marks]

2. **Database Directory / Security**

   (a) What is the direct result of issuing a *CREATE TABLE* statement?

   - A table descriptor containing the meta-data of the new table is added to the system catalogue.

   [2 Marks]

   ***(b)* What is the direct result of issuing a *GRANT SELECT …* statement?**

   - The GRANT command gives permissions on tables/databases to SELECTED database users.

   [2 Marks]

   ***(c)* Specify how a user might be allowed to read data from the EMPLOYEE table and modify the Salary values.**

   - GRANT SELECT on Employee.* TO user;
   - GRANT UPDATE.Salary ON Employee TO user;

   [4 Marks]

   (e) How does the DBMS subsequently ensure that user permissions are not violated?

   - Identifies the user and checks if the user has relevant permissions ***[2 Marks]***

EMPLOYEE	FNAME	MINIT	LNAME	SSN	BDATE	ADDRESS	SEX	SALARY	SUPERSSN	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	1968-07-19	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

DEPT_LOCATIONS	DNUMBER	DLOCATION
	1	Houston
	4	Stafford
	5	Bellaire
	5	Sugarland
	5	Houston

DEPARTMENT	DNAME	DNUMBER	MGRSSN	MGRSTARTDATE
	Research	5	333445555	1988-05-22
	Administration	4	987654321	1995-01-01
	Headquarters	1	888665555	1981-06-19

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
	987654321	30	20.0
	987654321	20	15.0
	888665555	20	null

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
	123456789	Michael	M	1988-01-04	SON
	123456789	Alice	F	1988-12-30	DAUGHTER
	123456789	Elizabeth	F	1967-05-05	SPOUSE

3. Database Manipulation

(a) **What is the result of executing the following statement? Explain in plain English.**

```
SELECT FNAME, LNAME, ADDRESS, DNAME
FROM EMPLOYEE, DEPARTMENT
WHERE DNO = DNUMBER
        AND DNAME != 'Admnistration'
        AND SSN NOT IN
                ( SELECT ESSN
                  FROM WORKS_ON
                  WHERE PNO IN
                        ( SELECT PNUMBER
                          FROM PROJECT
                          WHERE PNAME IN ('Computerization', 'Reorganization') ) )
```

- SELECT first name, last name, address and department name
  FROM the EMPLOYEE table and the DEPARTMENT table
  WHERE the employee did not work on the project 'Computerization Reorganization'

[5 Marks]

(b) **Construct a command in SQL to solve the following query, explaining why it had to employ the (outer) join method.**

"Find the name of each staff member and his/her dependent spouse, if any"

- SELECT CONCAT(Fname, Lname) AS Name, dependent_name
  FROM employee, dependent
  WHERE SSN = ESSN
  AND dependent.relationship = 'spouse';
- SELECT FNAME, LNAME, DEPENDENT_NAME
  FROM EMPLOYEE
  LEFT OUTER JOIN
  (SELECT * FROM DEPENDENT WHERE RELATIONSHIP = 'SPOUSE') AS D
  ON ESSN = SSN;
- The join method had to be employed to match up the employees in EMPLOYEE table with the correct spouses in DEPENDANT table using a common identifying attribute: EMPLOYEE.SSN, DEPENDENT.ESSN.

[5 Marks]

(c) **Construct a command in SQL to solve the following query, using (i) the *join* method, and (ii) the *subquery* method.**

"Find the identity name of each staff member who has worked more than 20 hours on the Computerization project"

- **(i)** SELECT CONCAT(Fname, Lname) AS Name
  FROM employee, works_on, project
  WHERE hours > 20
  AND Pname = 'Computerization'
  AND SSN = ESSN
  AND PNO = PNUMBER;

- **(ii)** SELECT CONCAT(Lname, Fname) AS Name
  FROM employee, works_on
  WHERE hours > 20
  AND SSN = ESSN
  AND Pname =
  (SELECT Pname
  FROM project
  WHERE Pname = 'Computerization');

- SELECT CONCAT(FNAME, ' ', LNAME) AS NAME
  FROM EMPLOYEE
  WHERE SSN IN

```
( SELECT ESSN
  FROM WORKS_ON
  WHERE HOURS > 20
    AND PNO IN
     ( SELECT PNUMBER
        FROM PROJECT
        WHERE PNAME = “Computerization” ) ) );
```

[10 Marks]