OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND

COLÁISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK

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Summer Examinations 2017

CS2501

Database Design and Administration

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The use of calculators is permitted

1.5 Hours

Answer All Questions

Paper Total: 80 Marks

PLEASE DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO

PLEASE ENSURE THAT YOU HAVE THE CORRECT EXAM PAPER

Ref. CompanyDB Database

1. Database Specification

(a) In a relational database, specify what *constraints* can be applied during table creation. Why do some database designers choose to apply a minimal number of constraints – can the same effect be achieved in other ways? *[3 Marks]*

(b) Specify the SQL statement that would define the DEPENDENT table, and maintain key integrity and referential integrity. Does it make sense to including a cascading deletion as part of the constraint? *[3 Marks]*

(c) In the CompanyDB database, why do you believe that departmental information is spread across two tables (DEPARTMENT & DEPT_LOCATIONS)? Would it make sense to integrate the data into a single table? Is there any way to achieve integration, either real or virtual? Explain. *[3 Marks]*

2. Database Directory / Security

(a) What is the direct result on the Directory of issuing a *DROP TABLE* statement? *[3 Marks]*

(b) Give an example of a *GRANT* statement that would give a named user a specified permission on a specified table/view. What impact would this have on Directory table(s)? *[3 Marks]*

(c) Early database management systems actively promoted direct user engagement with the database directory. This is not the case anymore. Give an example and explain why. *[3 Marks]*

(d) What validation steps would be applicable to the following SQL statement, and how exactly would they be checked? Under what conditions would the statement succeed? *[3 Marks]*

```
UPDATE DEPT_LOCATIONS
SET DLOCATION = 'Austin'
WHERE DNUMBER = 5;
```

(e) Is there any way that the owner of the EMPLOYEE table could give another user read access to it, with the exception of the Salary field, and prevent that user from passing on permission to a third party? How? *[3 Marks]*

3. Database Manipulation

(a) In SQL, a simple single-table request such as "Find the name of work colleagues of Alicia Zelaya" cannot be expressed as a simple single-table query. Why? Show how it could be done. *[2 Marks]*

(b) Construct a command in SQL to solve the following query, using (i) the *join* method and (ii) the *subquery* method: *[4 Marks each]*

"Find the identity and name of each department that has employees working on Houston-based projects"

(c) Specify the definition of a *view* that would simplify the query of (b) above. It should be of the form

DeptProjLocations (Dnumber, Dname, Pnumber, Plocation)

and contain details of department and projects/locations where their employees work.

Now write the query of (b) against this view, and indicate how it would have been modified into an equivalent query against base tables. *[4 Marks each]*

(d) Construct a command in SQL to solve the following data requirements: *[4 Marks each]*

"Find the identity and name of each staff member of the Research department who has more than one dependent"

"Find the identity and name of each staff member of the Research department, together with the name of his/her dependent"

4. Database Programming

(a) Embedded SQL (ESQL)

(i) How and why does ESQL insist on separating SQL code from host program code? *[2 Marks]*

(ii) ESQL closely mimics how programming languages interact with files. Illustrate this with any two examples. *[3 Marks]*

(iii) What exactly is SQLCA, and how does it work? *[3 Marks]*

(b) PHP Programming

(i) What function does each of the following PHP function calls fulfil? *[1 Mark each]*

```
MYSQL_CONNECT
MYSQL_QUERY
MYSQL_NUM_FIELDS
MYSQL_NUM_ROWS
... OR DIE ('Message')
MYSQL_FREE_RESULT
```

(ii) PHP can dynamically send HTML to a user's browser. How? Give an example. *[4 Marks]*

(iii) Write a fragment of PHP code to determine the name of employees in the Research Department and output the result to a user's browser. Do not worry about login, database selection, etc - focus only on executing the query and displaying the result. *[8 Marks]*

What modifications to your code would be necessary if you wanted to generalise its applicability – i.e. if it was to determine the name of employees of *any user-specified* department name? Program code is not necessary; just specify the main changes required.

[4 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

CompanyDB: Personnel Database of a Consultancy Company