CS4347.0U1 Database Systems

Assignment 2:

Due back on: Sunday, June 21, 2015 at 11:00pm.

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Any submission that is missed will be graded with a zero. Please do not insist for exceptions.

Purpose: Demonstrate the ability to understand and implement SQL, including DDL and DML, understand the correspondence between natural language queries, Relational Algebra and SQL statements.

1. (10 POINTS) Codd's scholarly paper "A Relational Model of Data for Large Shared Data Banks", Communications of the ACM, Vol 13(6), 1970 is considered as the underlying theory behind today's relational databases. Attached to assignment2, you may find this paper (codd.pdf). Please read this paper and comment on two topics that pulled your attention. The answer is flexible, so you may discuss any two topics you've found important in the paper within max. one page (Times New Roman 12 points single space).

2. (60 POINTS) Following is a database state for a University database:

STUDENT

StdSSN	StdFName	StdLName	StdCity	StdState	StdZip	StdMajor	StdYear	StdGPA
123456791	Hanes	Wilson	Savon	OK	68123-1113	IT	Freshman	3.10
124567892	Blake	Nuke	Burwick	OK	68013-2123	FIL	Junior	2.80
234567892	Claire	Keller	Thomasville	OK	69044-3323	ART	Junior	3.60
345678903	Wayne	Keller	Savon	OK	68125-1143	IT	Senior	2.90
456789014	Josh	Eckart	Savon	OK	68123-2335	FIL	Senior	3.30
567890125	Maggie	Diamond	Savon	OK	68116-0023	IT	Junior	3.70
678901236	Tammy	Diamond	Richmond	OK	68118-2346	ART	Sophomore	3.40
789012347	Richard	Moore	Savon	OK	68123-2214	FIL	Junior	2.60
876543212	Chris	Coleman	Savon	OK	68116-1334	IT	Senior	4.00
890123458	Lance	Brave	Savon	OK	98118-0023	IT	Senior	2.30
901234569	Winston	Pale	Burwick	OK	98115-1887	IT	Sophomore	3.90

FACULTY

FacSSN	FacFName	FacLName	FacCity	FacState	FacZip	FacStartDate	FacDept	FacRank	FacSalary	FacSupervisor
098765434	Liam	Victor	Savon	OK	681139923	10-Apr-08	MATH	ASST	65000	654321100
543210989	Valerie	Edwards	Burwick	OK	680132244	15-Apr-09	MATH	PROF	150000	
654321100	Liam	Fuller	Savon	OK	681230096	1-May-07	MATH	ASSOC	100000	543210989
765432111	Nicole	Marson	Birmingham	OK	680179947	11-Apr-10	FIL	PROF	95000	
876543212	Chris	Coleman	Savon	OK	681161334	1-Mar-12	MATH	ASST	70000	654321100
987654323	Jane	Miller	Savon	OK	681169956	15-Mar-13	FIL	ASSOC	105000	765432111

OFFERING

OfferNo	CourseNo	OfferTerm	OfferYear	OfferLocation	OfferTime	OfferDays	FacSSN
1121	IT330	Sum	2013	AMPH312	11:30AM	MW	
1244	IT330	Fall	2012	AMPH312	11:30AM	MW	098765434
2232	IT470	Sum	2012	AMPH422	2:30PM	TR	
3343	IT330	Spr	2013	AMPH224	9:30AM	MW	098765434
4331	IT330	Fall	2012	AMPH224	4:30PM	TR	098765434
4454	IT330	Win	2013	AMPH312	4:30PM	TR	543210989
5565	FIL310	Win	2013	AMPH217	9:30AM	MW	765432111
5688	IT490	Win	2013	AMPH312	11:30AM	MW	987654323
5689	IT490	Spr	2013	AMPH422	4:30PM	TR	876543212
6676	FIL460	Win	2013	AMPH222	11:30AM	TR	987654323
7787	FIL490	Spr	2013	AMPH315	2:30PM	MW	765432111
8898	IT330	Sum	2013	AMPH415	2:30PM	MW	654321100
9886	IT470	Spr	2013	AMPH317	2:30PM	TR	654321100

COURSE

CourseNo	CourseDescription	CourseCredit
FIL310	Introduction to Philology	3
FIL460	Ancient Greek	3
FIL490	Latin Literature	3
IT330	Data Structures	3
IT470	Algorithmic Analysis	3
IT480	Software Engineering	3
IT490	Object Oriented Design	3

ENROLLMENT

OfferNo	StdSSN	Grade
1244	123456791	3.30
1244	234567892	3.70
1244	345678903	3.30
1244	456789014	3.20
1244	567890125	3.90
1244	678901236	3.50
4331	123456791	3.60
4331	124567892	3.30
4331	789012347	3.60
4331	876543212	3.20
4331	890123458	3.50
4331	901234569	3.20
5565	123456791	3.30
5565	124567892	2.80
5688	123456791	3.30
5688	234567892	2.90
5688	345678903	3.40
5688	456789014	3.50
5688	567890125	2.70
5689	123456791	2.10
5689	124567892	3.80
5689	678901236	3.40
5689	789012347	3.90
5689	890123458	3.00
5689	901234569	3.20
6676	234567892	3.20
6676	567890125	3.70
7787	876543212	3.50
7787	890123458	3.80
7787	901234569	3.50
9886	124567892	3.60
9886	234567892	3.30
9886	345678903	3.30
9886	456789014	3.50
9886	567890125	2.70
9886	678901236	3.40
9886	901234569	4.00

Though it is possible to infer the referential integrity (foreign key) constraints by looking at the database state for this database, they are explicitly given for your convenience as follows:

Referential Integrity Constraints Table

Referential Integrity Constraint Number	Referencing		Referenced		Event	Action
	Table	Attribute	Table	Attribute		
1	OFFERING	FacSSN	FACULTY	FacSSN	None	None
					None	None
2	OFFERING	CourseNo	COURSE	CourseNo	None	None
					None	None
3	ENROLLMENT	OfferNo	OFFERING	OfferNo	Delete	Cascade
					Update	Cascade
4	ENROLLMENT	StdSSN	STUDENT	StdSSN	None	None
					None	None
5	FACULTY	FacSupervisor	FACULTY	FacSSN	None	None
					None	None

A.) (15 POINTS) Create this database. You may use any relational database system (such as MS Access, MySQL, Oracle, Microsoft SQL server, etc.) for this question. As students may use various database environments, please provide the create table AND all data population (insert) statements (either attached as an .sql file or as an inline text) in your answer document file.

B.) (5 POINTS) A screenshot of the content of each file in your database environment, i.e. STUDENT, FACULTY, OFFERING, COURSE, and ENROLLMENT

C.) (5 POINTS) A screenshot of the database diagram that shows all tables, their PKs and FKs, and all relationships among tables. Please draw this by either using the draw database diagram feature of your database system, or use a professional tool such as:

- **MS Visio (a 60-day trial version is available at http://technet.microsoft.com/en-US/evalcenter/hh973399?WT%2Eintid1=ODC_ENUS_FX103791368_XT104000916)**
- **Modelio (Free at http://archive.modeliosoft.com/en/products/modelio-free-edition.html)**
- **Creatly (Free at http://creately.com/)**
- **Balsamiq mockups (Free at http://www.balsamiq.com/products/mockups)**
- **IBM Rational Software Architect (RSA) (available via Dreamspark), etc.**

D.) (5 POINTS) Test that the referential integrity constraint 3 (between the ENROLLMENT table and the OFFERING table) is satisfied properly by your design. Please provide supporting screenshots of your test.
IMPORTANT: Please remember to restore your database state to its original after this test by reinserting any tuples that you have removed.

E.) (30 POINTS) Please provide the following for each of the 5 queries below:
1. Relational Algebra expression
2. SQL statement
3. The screenshot of the resulting table

Query1. Increment the salaries of Faculty by 20% who started working at the University after 2009. Display faculty with his Fname, Lname, start date and the NEW (incremented) salary fields.

Query2: Display the OfferNo and CourseNo of Summer2012 courses which has no faculty assigned.

Query3: Display each student major and average GPA for each student major.

Query4: Display in ascending order of GPA the firstname, lastname, and GPA of each senior student.

Query5: Display the Faculty firstname and lastname, OfferNo, and CourseNo of the IT courses that were taught by Asst. instructors in Fall 2012.

3. (20 POINTS) Given an arbitrary state of the COMPANY database as follows:

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
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

A view called DEPT_SUMM is defined on the COMPANY database as follows:

```
CREATE VIEW  DEPT_SUMM (D, C, Total_s, Average_s) AS
        SELECT  Dno, COUNT (*), SUM (Salary), AVG (Salary)
        FROM  EMPLOYEE
        GROUP BY  Dno;
```

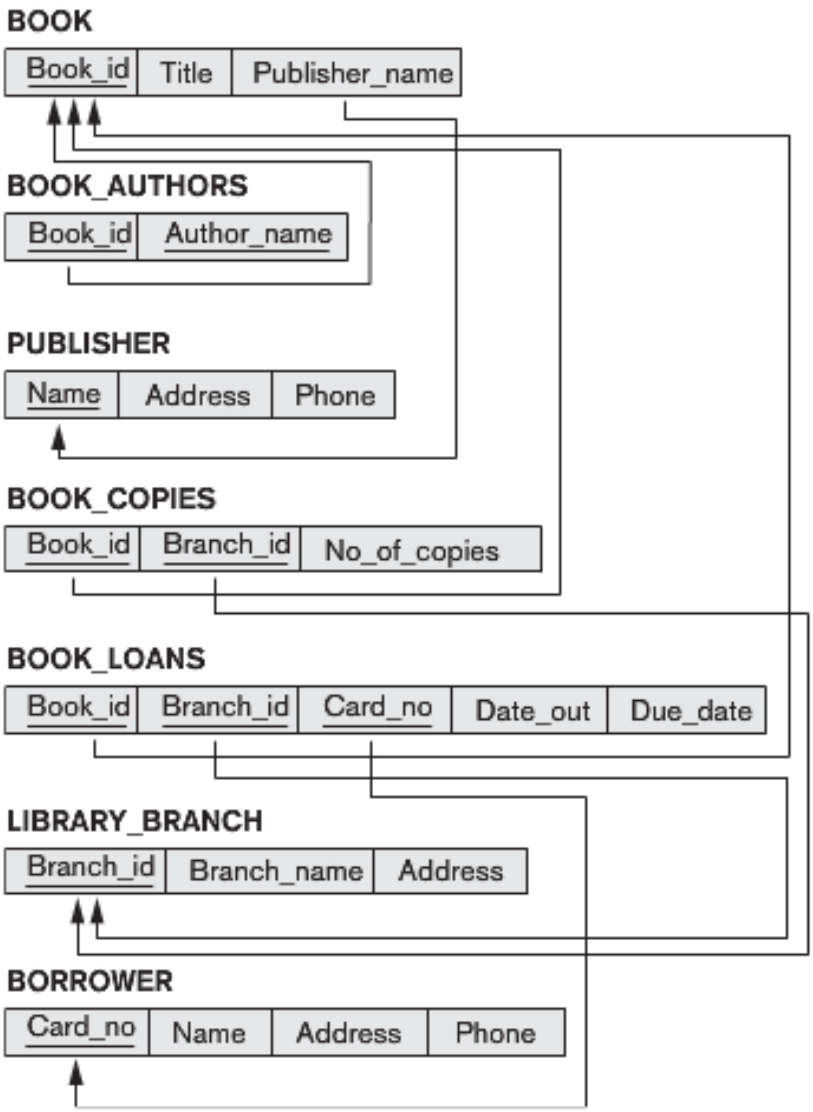
A.) Would the following query be allowed on the DEPT_SUMM view? If so, what would be the corresponding query on the base relation(s)?

```
SELECT  *
FROM  DEPT_SUMM;
```

B.) Would the following update be allowed on the DEPT_SUMM view? If so, what would be the corresponding query on the base relation(s)?

```
UPDATE DEPT_SUMM
SET D=3
WHERE D=4;
```

4. (10 POINTS) Consider the LIBRARY relational database schema below to write down the relational algebra expressions for the following two queries. No SQL statements are required.



A.) List the number of copies of the book titled "The Fountainhead" in the "Davis" library branch.

B.) List the number of copies of the book titled "The Fountainhead" owned by each library branch.

Naming Convention:

If you are submitting multiple files, please create a ZIP file of all your files and use the following naming convention for your ZIP file:
CS4347-Assignment<number>-<FirstName><LastName>.zip.

So, student John Smith will name his 1st assignment zip file as:

CS4347-Assignment1-JohnSmith.zip

If you are submitting a single file, please name your file as:

CS4347-Assignment1-JohnSmith.doc or .pdf, etc.

Good luck.