CMSC 23500 — Introduction to Database Systems
Homework #4
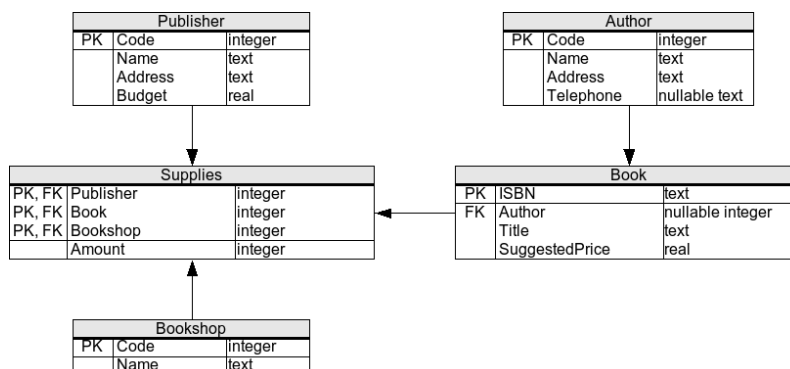
April 24, 2008

Instructions

For this homework, you must submit two SQL files (`exercise1.sql` and `exercise2.sql`) with the solution to your exercises. The SQL code contained therein must run correctly under SQLite. *Incorrect code will receive, at most, half credit.* The grader will test the code like this:

```
$ sqlite3 bookshop.db < exercise1.sql
$ sqlite3 hospital.db < exercise2.sql
```

`bookshop.db` will be an empty database, and `hospital.db` will be the same Hospital database file provided with this homework on the course website.

1 Database creation (30 points)

Write the CREATE TABLE statements for the following relational database (10 points):

Publisher		
PK	Code	integer
	Name	text
	Address	text
	Budget	real

Author		
PK	Code	integer
	Name	text
	Address	text
	Telephone	nullable text

Supplies		
PK, FK	Publisher	integer
PK, FK	Book	integer
PK, FK	Bookshop	integer
	Amount	integer

Book		
PK	ISBN	text
FK	Author	nullable integer
	Title	text
	SuggestedPrice	real

Bookshop		
PK	Code	integer
	Name	text

Write the INSERT statements to add the following data to the database (10 points):

Publisher

Code	Name	Address	Budget
1	"Random J. House"	"42 Foobar Drive"	10000
2	"Morgan's Laws Kaufmann"	"37 Snafu Street"	25000

Book

ISBN	Author	Title	SuggestedPrice
1111111	1001	"Ender's Game"	19.99
2222222	1002	"I, Robot"	25.99
3333333	NULL	"El Mio Cid"	12.99

Supplies

Publisher	Book	Bookshop	Amount
1	1111111	1	50
1	1111111	2	100
1	2222222	2	75
1	3333333	1	150
2	1111111	2	25
2	2222222	1	225
2	3333333	2	175

Bookshop

Code	Name
1	"Dennis's House of Books"
2	"Ritchie's Bookshop"

Author

Code	Name	Address	Telephone
1001	Orson Scott Card	"Greensboro, North Carolina"	"555-1024"
1002	Isaac Asimov	"Not Applicable"	NULL

Create a view called SuppliesView with the following information (10 points):

- Publisher name

- Book title

- Bookshop name

- The number of books supplied by the publisher to the bookshop

2 Queries (10 points each, 70 total)

Write the following queries in SQL. All these queries depend on the Hospital database (schema shown in figure 1). See the Discussion Session #4 handout (April 21) for more details on how to interpret the schema.

1. Malpractice queries (from Discussion Session #4). Write the following two queries:

Appointment

	Field	Type
PK	AppointmentID	integer
FK	Patient	integer
FK	PrepNurse	nullable integer
FK	Physician	integer
	Start	datetime
	End	datetime
	ExaminationRoom	text

Nurse

	Field	Type
PK	EmployeeID	integer
	Name	text
	Position	text
	Registered	boolean
	SSN	integer

Medication

	Field	Type
PK	Code	integer
	Name	text
	Brand	text
	Description	text

Block

	Field	Type
PK	Floor	integer
PK	Code	integer

On_Call

	Field	Type
PK, FK	Nurse	integer
PK, FK	BlockFloor	integer
PK, FK	BlockCode	integer
PK	Start	datetime
PK	End	datetime

Prescribes

	Field	Type
PK, FK	Physician	integer
PK, FK	Patient	integer
PK, FK	Medication	integer
PK	Date	datetime
FK	Appointment	nullable integer
	Dose	text

Room

	Field	Type
PK	Number	integer
	Type	text
FK	BlockFloor	integer
FK	BlockCode	integer
	Unavailable	boolean

Stay

	Field	Type
PK	StayID	integer
FK	Patient	integer
FK	Room	integer
	Start	datetime
	End	datetime

Department

	Field	Type
PK	DepartmentID	integer
	Name	text
FK	Head	integer

Physician

	Field	Type
PK	EmployeeID	integer
	Name	text
	Position	text
	SSN	integer

Patient

	Field	Type
PK	SSN	integer
	Name	text
	Address	text
	Phone	text
	InsuranceID	integer
FK	PCP	integer

Affiliated_with

	Field	Type
PK, FK	Physician	integer
PK, FK	Department	integer
	PrimaryAffiliation	boolean

Trained_In

	Field	Type
PK, FK	Physician	integer
PK, FK	Treatment	integer
	CertificationDate	datetime
	CertificationExpires	datetime

Procedure

	Field	Type
PK	Code	integer
	Name	text
	Cost	integer

Undergoes

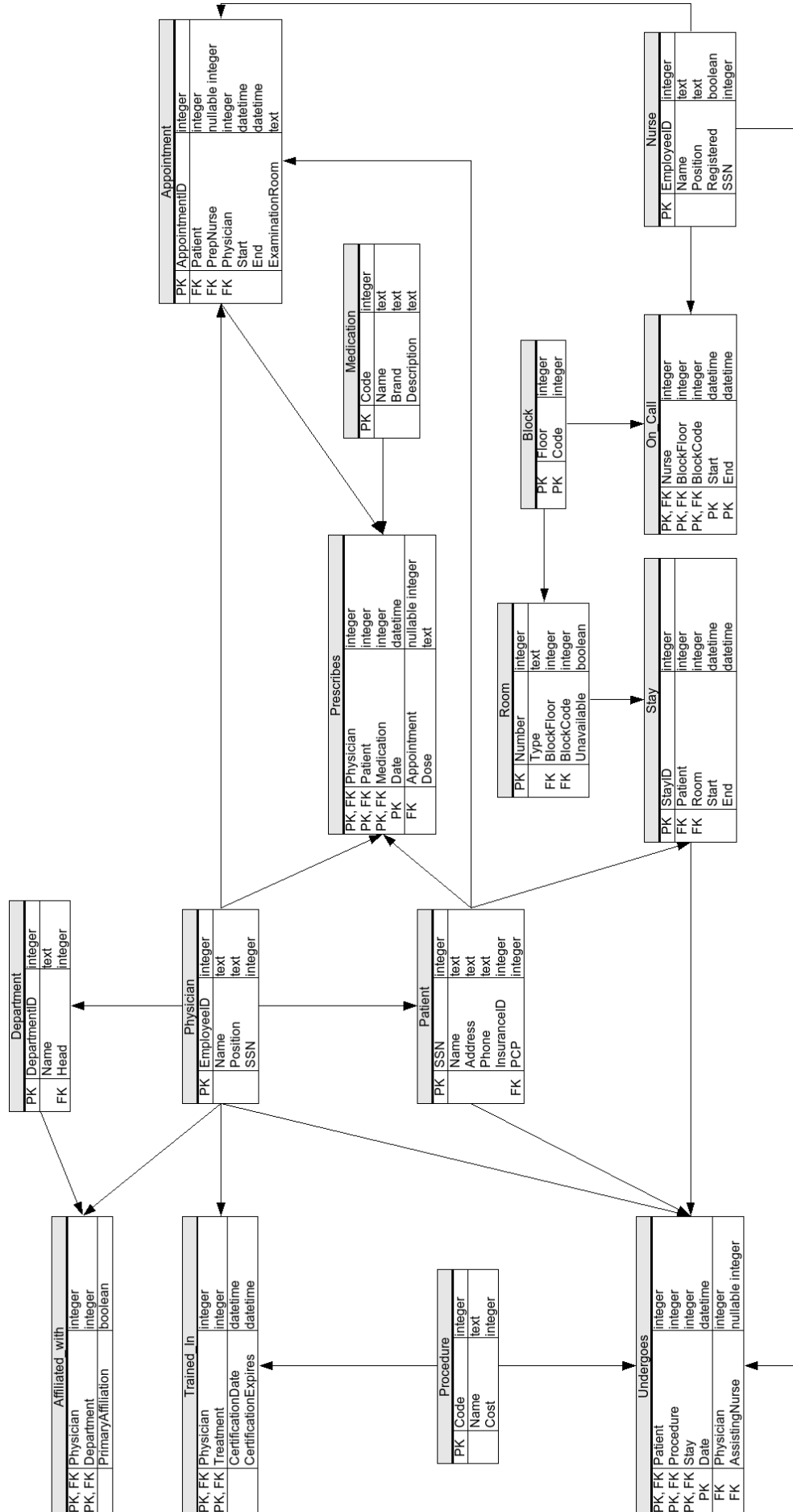|	Field	Type
PK, FK	Patient	integer
PK, FK	Procedure	integer
PK, FK	Stay	integer
PK	Date	datetime
FK	Physician	integer
FK	AssistingNurse	nullable integer

Figure 1: Relational schema for the Hospital database

- Obtain the names of all physicians that have performed a medical procedure they have *never* been certified to perform.

  ```
  Name
  ----------------
  Christopher Turk
  ```

- Obtain the names of all physicians that have performed a medical procedure that they are certified to perform, *but* such that the procedure was done at a date (Undergoes.Date) after the physician's certification expired (Trained_In.CertificationExpires).

  ```
  Name
  ------------
  Todd Quinlan
  ```

2. Same as the previous queries, but include the following information in the results: Physician name, name of procedure, date when the procedure was carried out, name of the patient the procedure was carried out on. In the second query, also include the date when the certification expired.

   ```
   Physician          Procedure              Date        Patient
   ----------------   ---------------------  ----------  ----------
   Christopher Turk   Complete Walletectomy  2008-05-13  Dennis Doe
   ```

   ```
   Physician      Procedure                  Date        Patient
   ------------   ------------------------   ----------  ----------
   Todd Quinlan   Obfuscated Dermogastrotomy  2008-05-09  Dennis Doe

   CertificationExpires
   --------------------
   2007-12-31
   ```

3. Obtain the information for appointments where a patient met with a physician other than his/her primary care physician. Show the following information: Patient name, physician name, nurse name (if any), start and end time of appointment, examination room, and the name of the patient's primary care physician. Note: You will have to read up on SQL's LEFT JOIN operator.

```
Patient     Physician     Nurse         Start
----------  ------------  ------------  ----------------
Dennis Doe  Percival Cox  Paul Flowers  2008-04-25 10:00
Dennis Doe  Percival Cox                2008-04-26 10:00
John Smith  Christopher                 2008-04-26 12:00
Dennis Doe  Molly Clock   Laverne Robe  2008-04-27 10:00


End               ExaminationRoom  PCP
----------------  ---------------  ----------------
2008-04-25 11:00  B                Christopher Turk
2008-04-26 11:00  C                Christopher Turk
2008-04-26 13:00  C                John Dorian
2008-04-21 11:00  A                Christopher Turk
```

4. The Patient field in Undergoes is redundant, since we can obtain it from the Stay table. There are no constraints in force to prevent inconsistencies between these two tables. More specifically, the Undergoes table may include a row where the patient ID does not match the one we would obtain from the Stay table through the Undergoes.Stay foreign key. Select all rows from Undergoes that exhibit this inconsistency.

```
Patient     Procedure   Stay        Date        Physician
----------  ----------  ----------  ----------  ----------
100000001   7           3217        2008-05-10  7


AssistingNurse
--------------
101
```

5. Deadly nurse query (from Discussion Session #4): Obtain the names of all the nurses who have ever been on call for room 123.

```
Name
---------------
Laverne Roberts
Paul Flowers
```

6. The hospital has several examination rooms where appointments take place. Obtain the number of appointments that have taken place in each examination room.

```
ExaminationRoom  Number
---------------  ----------
A                3
B                3
C                3
```

7. Obtain the names of all patients (also include, for each patient, the name of the
   patient's primary care physician), such that *all* the following are true:

   - The patient has been prescribed some medication by his/her primary care
     physician.
   - The patient has undergone a procedure with a cost larger that $5,000
   - The patient has had at least two appointment where the nurse who prepped
     the appointment was a registered nurse.
   - The patient's primary care physician is *not* the head of any department.

```
Name        Name
----------  -----------
John Smith  John Dorian
```