

A. For the schema described in the class, write down the queries in relational algebra for the questions such as (Q3), (Q4), (Q7), (Q8).

(Q3) Find the colors of boats reserved by Lubber.

```
select b.color
from boats b, reserves r, sailors s
where b.bid = r.bid and s.sid = r.sid
group by b.color
having s.name = 'Lubber';
```

(Q4) Find the names of sailors who have reserved at least one boat.

```
select s.sname
from sailors s, reserves r
where s.sid = r.sid
group by s.sname;
```

(Q7) Find the names of sailors who have reserved at least two boats.

```
select s.sname
from sailors s, reserves r
where s.sid = r.sid
group by s.sname
having count(*) >= 2;
```

(Q8) Find the sids of sailors with age over 20 who have not reserved a red boat.

```
select s.sname
from sailors s, reserves r, boats b
where s.sid = r.sid and b.bid = r.bid
and s.age > 20
```

and s.sid not in

(select s.sid from sailors s, reserves r, boats b

where s.sid=r.sid and b.bid=r.bid

and b.color = 'red');

B. The following problems are extracted from other textbook. For the following schema, answer the questions.

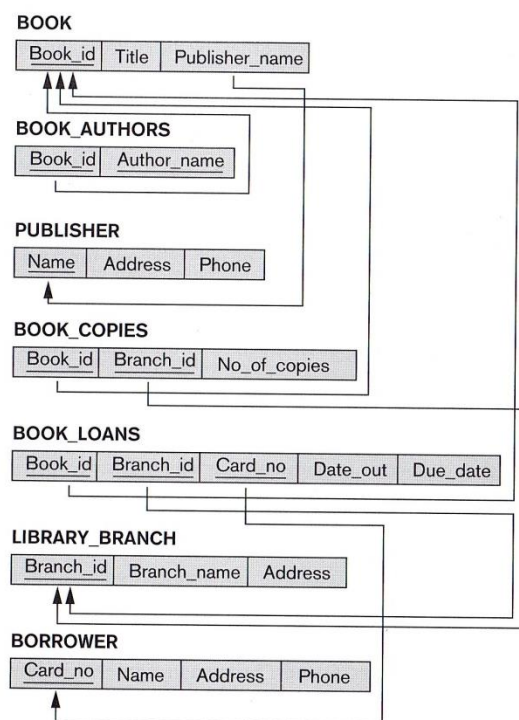


Figure 6.14
A relational database
schema for a LIBRARY
database.

6.18 - Consider the LIBRARY relational schema shown in Figure 6.14, which is used to keep track of books, borrowers, and book loans. Referential integrity constraints are shown as directed arcs in Figure 6.14, as in the notation of Figure 3.7. Write down a relational algebra expression for the following query, if possible. Note that some queries may not be possible to be expressed in relational algebra. Also write down an SQL statement for each query.

- (a) How many copies of the book titled The Lost Tribe are owned by the library branch whose name is "Sharpstown"?

select No_Of_copies

from Book_Copies as B, Library_Branch as L, BOOK_COPIES as BP

where B.Title = 'The Lost Tribe' and L.Branch_Name = 'Sharpstown'

and B.Book_id = BP.Book_id and BP.Branch_id = L.Branch_id

(b) How many copies of the book titled The Lost Tribe are owned by each library branch?

```
select BranchID, No_Of_Copies
from Book B, BOOK_COPIES BC
where B.Title = 'The Lost Tribe' and B.Book_id = BC.Book_id
```

(c) Retrieve the names of all borrowers who do not have any books checked out.

```
select B.Name
from Borrower B
where B.CardNo NOT IN ( select Card_No from Book_Loans)
```

(d) For each book that is loaned out from the "Sharpstown" branch and whose DueDate is today, retrieve the book title, the borrower's name, and the borrower's address.

```
select B.Title, Bo.Name, Bo.Address
from Library_Branch L, Book_Loans BL, Book B, Borrower Bo
where L.Branch_Name = 'Sharpstown' and L.Branch_id = BL.Branch_id and
      BL.Due_date = '2015-10-15' and BL.Card_no = B.Card_no and BL.Book_id =
      B.Book_id
```

(e) For each book authored (or co-authored) by "Stephen King", retrieve the title and the number of copies owned by the library branch whose name is "Central".

```
select B.Title, BC.No_of_copies
from Book_Authors BA, Book B, Library_Branch L, Book_Copies BC
where BA.Author_name = 'Stephen King' and L.Branch_name = 'Central' and
      L.Branch_id = BC.Branch_id
```