

## CISC 7512X Midterm Exam

For the below questions, use the following schema definition.

```
book(isbn,title,subject)
indvdl(iid,fname,lname,dob)
bkauthr(isbn,iid)
liblog(logid,evttype,isbn,iid,ts)
```

This is a schema for a library. The `book` table info on books. The `indvdl` table has all the individuals, such as book borrowers and book authors. The `bkauthr` table links `indvdl` authors to `book` records. The `liblog` has the log of book transactions. For example:

```
liblog(1,evttype=N,isbn=123456789,iid=NULL,ts=2012-01-02 08:01:00) // new book
liblog(2,evttype=B,isbn=123456789,iid=2,ts=2013-03-27 08:01:00) // book borrowed
liblog(3,evttype=R,isbn=123456789,iid=2,ts=2013-04-07 14:01:00) // book returned
liblog(2,evttype=X,isbn=123456789,iid=NULL,ts=2006-12-31 08:01:00) // book destroyed
```

In other words, for `evttype`, N=new book, B=borrow, R=return, and X=book destroyed. Note that `book` table doesn't tell you what books are available in the library, you need to consult the `liblog` table for that.

Pick the best answer that fits the question. Not all of the answers may be correct. If none of the answers fit, write your own answer. There are at most 2 questions where writing your own answer may be appropriate.

- (5 points) How many books have “computer” in their title?
  - select group by count(\*) from book where upper(title) like '%COMPUTER%';
  - select title,count(\*) from book where upper(title) like '%COMPUTER%' group by title;
  - select count(\*) from book where upper(title) like '%COMPUTER%';
  - select sum(1)/count(\*) from book where upper(title) like '%COMPUTER%';
  - Other:
- (5 points) Find author of 'Catch 22'
  - select fname,lname from book where upper(a.title)='CATCH 22'
  - select b.fname,b.lname from book a inner join bkauthr b where upper(a.title)='CATCH 22'
  - select c.fname,c.lname from book a inner join bkauthr b on a.iid = b.iid inner join indvdl c on b.isbn=c.isbn where upper(a.title)='CATCH 22'
  - select c.fname,c.lname from book a inner join bkauthr b on a.isbn = b.isbn inner join indvdl c on b.iid=c.iid where upper(a.title)='CATCH 22'
  - Other:
- (5 points) Find average age of individuals with first name “Jack”.
  - select avg(cast(to\_char(now()-dob,'YYYY') as int)) from indvdl where fname='Jack';
  - select avg(dob) from indvdl where fname='Jack';
  - select avg(age) from indvdl where fname='Jack';

- (d) `select avg(cast(age as int)) from indivl where fname='Jack';`  
 (e) Other:
4. (5 points) Create `authors` table that will only have book authors.
- (a) `create table authors as select * from indivl where author is true;`  
 (b) `create table authors as select distinct c.* from book a inner join bkauthr b on a.isbn = b.isbn inner join indivl c on b.iid=c.iid;`  
 (c) `create table authors as select * bkauthr;`  
 (d) `create table authors as select c.* from book a inner join bkauthr b on a.isbn = b.isbn inner join indivl c on b.iid=c.iid;`  
 (e) Other:
5. (5 points) Find all books without an author.
- (a) `select a.isbn from book a inner join bkauthr b on a.isbn = b.isbn where b.isbn is null;`  
 (b) `select a.isbn from book a left outer join bkauthr b on a.isbn = b.isbn where b.isbn is null;`  
 (c) `select a.isbn from book a left outer join bkauthr b on a.isbn = b.isbn where a.isbn is null;`  
 (d) `select a.isbn from book a left outer join bkauthr b on a.isbn = b.isbn;`  
 (e) Other:
6. (5 points) Find all books written by Mark Twain.
- (a) `select c.* from indivl a inner join bkauthr b on a.iid=b.iid inner join book c on b.isbn=c.isbn where a.fname='Mark' and lname='Twain';`  
 (b) `select b.* from indivl a inner join bkauthr b on a.iid=b.iid where a.fname='Mark' and lname='Twain';`  
 (c) `select a.* from indivl a inner join bkauthr b on a.iid=b.iid inner join book c on b.isbn=c.isbn where a.fname='Mark' and lname='Twain';`  
 (d) `select c.* from indivl a inner join book c on b.isbn=c.isbn where a.fname='Mark' and lname='Twain';`  
 (e) Other:
7. (5 points) Find all books NOT written by anyone named "John".
- (a) `select a.isbn from book a left outer join bkauthr b on a.isbn=b.isbn left outer join indivl c on b.iid=c.iid group by a.isbn having fname!='John' and lname!='John';`  
 (b) `select a.isbn from book a left outer join bkauthr b on a.isbn=b.isbn left outer join indivl c on b.iid=c.iid group by a.isbn having coalesce(max(case when c.fname='John' then 1 else 0 end),0)=0;`  
 (c) `select a.isbn from book a left outer join bkauthr b on a.isbn=b.isbn left outer join indivl c on b.iid=c.iid where fname!='John' and lname!='John';`  
 (d) `select a.* from book a left outer join bkauthr b on a.isbn=b.isbn left outer join indivl c on b.iid=c.iid having coalesce(max(case when c.fname='John' then 1 else 0 end),0)=0;`  
 (e) Other:

8. (5 points) What percentage of authors are named 'John'?
- (a) `select sum(case when fname='John' then 1.0 else 0.0 end)/sum(1.0)*100.0 prcnt from authors`
  - (b) `select percentage() from authors where fname='John'`
  - (c) `select sum(when fname='John' then 1 end)/sum(when fname!='John' then 1 end) from authors`
  - (d) `select percentage( sum(case when fname='John' then 1.0 else 0.0 end) ) from authors`
  - (e) Other:
9. (5 points) What percentage of individuals (indvdl) in our database are book authors?
- (a) `select sum(case when author=true then 1.0 else 0.0 end)/sum(1.0)*100.0 prcnt from indvdl a`
  - (b) `select sum(case when b.iid is null then 1.0 else 0.0 end)/sum(1.0)*100.0 prcnt from indvdl a left outer join authors b on a.iid=b.iid`
  - (c) `select percentage(author='Y') prcnt from indvdl a left outer join authors b on a.iid=b.iid`
  - (d) `select sum(case when b.iid is not null then 1.0 else 0.0 end)/sum(1.0)*100.0 prcnt from indvdl a left outer join authors b on a.iid=b.iid`
  - (e) Other:
10. (5 points) Authors who have ever borrowed their own book.
- (a) `select b.iid from book a inner join author b on a.isbn=b.isbn`
  - (b) `select b.iid from book a inner join liblog b on b.isbn=c.isbn and b.iid=a.iid where b.evtttype='B'`
  - (c) `select b.iid from book a inner join bkauthr b on a.isbn=b.isbn inner join liblog c on b.isbn=c.isbn and b.iid=c.iid where c.evtttype='B'`
  - (d) `select max(b.iid) from book a inner join liblog c on a.isbn=c.isbn and a.iid=c.iid where c.evtttype='B'`
  - (e) Other:
11. (5 points) How many books does the library have?
- (a) `select sum(case when evtttype='N' then 1 when evtttype='X' then -1 else 0 end) from liblog`
  - (b) `select count(*) from books`
  - (c) `select count(*) from liblog where evtttype='N'`
  - (d) `select sum(case when evtttype='N' then 1.0 end) from liblog`
  - (e) Other:
12. (5 points) What's the most popular book (borrowed most often) in the library?
- (a) `select title from book where max(borrowed) = count(*)`
  - (b) `select max(title) from liblog where evtttype='B' having count(*) = max(count(*))`
  - (c) `with allcnts as (select * from liblog where evtttype='B'), maxcnt as (select max(count(*)) mc from allcnts) select a.isbn from allcnts a inner join maxcnt b on a.cnt=b.mc;`

- (d) with allcnts as (select isbn,count(\*) cnt from liblog where evttype='B' group by isbn), maxcnt as (select max(cnt) mc from allcnts) select a.isbn from allcnts a inner join maxcnt b on a.cnt=b.mc;
- (e) Other:
13. (5 points) Who borrows the most books?
- (a) select count(\*) from individual where borrower = max(borrower);
- (b) with allcnts as (select iid,count(\*) cnt from liblog where evttype='B' group by iid), maxcnt as (select max(cnt) mc from allcnts) select a.iid from allcnts a inner join maxcnt b on a.cnt=b.mc;
- (c) select max(count(\*)) from liblog group by iid;
- (d) select iid from (select count(\*) from liblog group by iid) a where cnt=max(count(\*))
- (e) Other:
14. (5 points) Is there a copy of 'CATCH 22' available to borrow right now?
- (a) select case when sum(case when evttype='RETURNED' then -1 when evttype='BORROWED' then 1 end) > 0 then 'AVAILABLE' else 'NOT AVAILABLE' end from liblog a where upper(a.title)='CATCH 22';
- (d) select case when sum(case when evttype in ('B') then -1 when evttype in ('N') then 1 end) > 0 then 'AVAILABLE' else 'NOT AVAILABLE' end from liblog a inner join book b on a.isbn=b.isbn where upper(b.title)='CATCH 22';
- (c) select count(available) from liblog where upper(b.title)='CATCH 22';
- (d) select case when sum(case when evttype in ('B','X') then -1 when evttype in ('R','N') then 1 end) > 0 then 'AVAILABLE' else 'NOT AVAILABLE' end from liblog a inner join book b on a.isbn=b.isbn where upper(b.title)='CATCH 22';
- (e) Other:
15. (5 points) Who has 'CATCH 22' borrowed right now?
- (a) select a.iid from liblog a inner join book b on a.isbn=b.isbn where upper(b.title)='CATCH 22' group by a.isbn,a.iid having sum(case when evttype='B' then 1 when evttype='R' then -1 end) != 0;
- (b) select a.iid from liblog a where upper(a.title)='CATCH 22';
- (c) select a.iid from liblog a inner join book b on a.isbn=b.isbn where upper(b.title)='CATCH 22';
- (d) select a.iid from liblog a inner join book b on a.isbn=b.isbn where upper(b.title)='CATCH 22' group by a.isbn,a.iid having count(\*) == 0;
- (e) Other:
16. (5 points) Find individuals who borrowed 'The Catcher in the Rye' in the last two months.
- (a) select iid from liblog where evttype='B' and ts>=now()-interval '2 month' and lower(title)='the catcher in the rye';
- (b) select a.iid from liblog a inner join indivl b on a.iid=b.iid where a.evttype='B' and ts>=now()-interval '2 month' and upper(b.title)='the catcher in the rye';

- (c) `select a.fname, a.lname from liblog a inner join book b on a.isbn=b.isbn where a.evtttype='B' and ts>=now()-interval '2 month' and lower(b.title)='the catcher in the rye';`
- (d) `select a.iid from liblog a inner join book b on a.isbn=b.isbn where a.evtttype='B' and ts>=now()-interval '2 month' and lower(b.title)='the catcher in the rye';`
- (e) Other:
17. (5 points) What's the most popular (borrowed most often) book subject?
- (a) `with counts as (select count(*) cnt from liblog where evtttype='R' group by iid), maxcnt as (select sum(cnt) mc from allcnts) select a.iid from allcnts a inner join maxcnt b on a.cnt=b.mc;`
- (b) `with allcnts as (select b.subject,count(*) cnt from liblog a inner join book b on a.isbn=b.isbn where a.evtttype='B' group by b.subject), maxcnt as (select max(cnt) mc from allcnts) select a.subject from allcnts a inner join maxcnt b on a.cnt=b.mc;`
- (c) `with allcnts as (select iid,sum(case when evtttype='B' then 1 when evtttype='R' then -1 end) cnt from liblog where evtttype not in ('N','X') group by iid), maxcnt as (select max(cnt) mc from allcnts) select a.iid from allcnts a inner join maxcnt b on a.cnt=b.mc;`
- (d) `with allcnts as (select b.subject,sum(1.0) cnt from liblog a inner join book b on a.isbn=b.isbn group by b.subject having a.evtttype='B'), maxcnt as (select max(cnt) mc from allcnts) select a.subject from allcnts a inner join maxcnt b on a.cnt=b.mc;`
- (e) Other:
18. (5 points) What is the top 1% most popular books (borrowed most often)?
- (a) `with allcnts as (select isbn,count(*) cnt from liblog a where evtttype='B' group by isbn), pr as (select a.*, row_number() over (order by cnt)/sum(1.0) over () pr from allcnts a) select isbn from pr a where pr>=0.99`
- (b) `with allcnts as (select b.subject,count(*) cnt from liblog a inner join book b on a.isbn=b.isbn where a.evtttype='B' group by b.subject), maxcnt as (select max(cnt) mc from allcnts) select a.subject from allcnts a inner join maxcnt b on a.cnt=b.mc`
- (c) `select isbn from liblog where percentile(borrowed)>99`
- (d) `select isbn where liblog group by isbn having percentile(iid)>0.95`
- (e) Other:
19. (5 points) Find outlier borrowng days (book borrowing count is over 2 standard deviations of the previous 20 days borrowing counts).
- (a) `select outliers(2sd,count(*)) from liblog where previous 20 days;`
- (b) `with stats as (select ts, count(*) cnt, avg( cnt ) over () avg20, stddev( cnt ) over () sd20 from liblog a where evtttype='B' group by ts ) select a.* from stats a where cnt >= avg20+2*sd20`
- (c) `with stats as (select ts, count(*) cnt, avg( count(*) ) over (order by ts rows between 20 preceding and current row) avg20, stddev( count(*) ) over (order by ts rows between 20 preceding and current row) sd20 from liblog a where evtttype='B' group by ts ) select a.* from stats a where cnt >= avg20+2*sd20`

- (d) with stats as (select cast(ts as date) dt, count(\*) cnt, avg( count(\*) ) over (order by cast(ts as date) rows between 20 preceding and current row) avg20, stddev( count(\*) ) over (order by cast(ts as date) rows between 20 preceding and current row) sd20 from liblog a where evttype='B' group by cast(ts as date) ) select a.\* from stats a where cnt >= avg20+2\*sd20
- (e) Other:

20. (5 points) When were the most books borrowed at any given time?

- (a) with cnts as (select ts, sum(1.0) over (order by ts) cnt from liblog a), maxcnt as (select max(cnt) mc from cnts) select a.ts from cnts a inner join maxcnt b on a.cnt=b.mc;
- (b) with cnts as (select ts, sum(case when evttype='B' then 1 when evttype='R' then -1 end) over (rows between unbounded preceding and unbounded preceding) cnt from liblog a), maxcnt as (select max(cnt) mc from cnts) select a.ts from cnts a inner join maxcnt b on a.cnt=b.mc;
- (c) with cnts as (select ts, sum(case when evttype='B' then 1 when evttype='R' then -1 end) over (order by ts rows between unbounded preceding and current row) cnt from liblog a), maxcnt as (select max(cnt) mc from cnts) select a.ts from cnts a inner join maxcnt b on a.cnt=b.mc;
- (d) with cnts as (select ts, sum(case when evttype='B' then 1 when evttype='R' then -1 end) over () cnt from liblog a), maxcnt as (select max(cnt) mc from cnts) select a.ts from cnts a inner join maxcnt b on a.cnt=b.mc;
- (e) Other: