CS 348 Review Questions

2. a) { EventID -> EventJournal (all attributes) }

b) { JourISBN -> JournalName, JournalName -> JourISBN, JourISBN -> Publisher }

c) The table is not in 3NF. The functional dependency JourISBN -> JournalName is a non-trivial functional dependency where JourISBN is not a superkey of EventJournal, and JournalName - JourISBN = JournalName is not contained in a candidate key of EventJournal. We can use the Compute3NF algorithm to create a 3NF decomposition of EventJournal.

We compute a minimal cover:
F = {EventID -> EventName, EventWebLink, JournalName, Publisher, JourISBN;
    JourISBN -> JournalName;
    JournalName -> JourISBN;
    JourISBN -> Publisher }

Fc = {EventID -> EventName, EventWebLink, Publisher, JourISBN;
    JourISBN ->JournalName;
    JournalName -> JourISBN }

The candidate keys are EventID. We decompose the table into

{(EventID, EventName, EventWebLink, Publisher, JourISBN), (JourISBN, JournalName)}

3. This is not a valid approach, since every non-primary key needs to be fully dependent on the primary key, and O and X are not fully dependent on PK, Y.

4. a) ContractID -> CustomerID, ServiceAddress, ServiceType, StartDate
CustomerID -> ServiceAddress

b) We use the primary key ContractID. This is a superkey of R, and every non-key is fully dependent on it.

c) I didn't list these in part (a) bc I only listed the non-redundant ones so here ya go:
ContractID -> CustomerID
ContractID -> CustomerID, ServiceAddress
ContractID -> CustomerID, ServiceAddress, ServiceType
ContractID -> ServiceAddress
...
I'm sure you get the idea

5. a) Every field must be byte-aligned. Each record takes 16+8+16+16 = 56 bytes.

b) floor(512/56) = 9. Each block can store 9 records. We need floor(5000/9) = 555 blocks.

c) In the worst-case, we search all the blocks. This would be 555 block accesses.

d) In the worst-case, we search all the blocks. This would be 555 block accesses.

8. Conflict-serializable schedule:
r3[a], r2[b], r1[a], w2[b],
r1[d], w1[d],
r2[d], w2[d],
r4[b],
w3[a], r3[c], w3[c],
w4[b], r4[a], w4[a]

Equivalent serial schedule:
r1[a], r1[d], w1[d],
r2[b], w2[b], r2[d], w2[d],
r3[a], w3[a], r3[c], w3[c],
r4[b], w4[b], r4[a], w4[a]

6. Result (same as Temp):

Rating	AvgAge
1	33
3	38.17
7	40
8	40.5
9	35
10	25.5

8. a) T2read(Z), T3write(Z)
T2read(Y), T3write(Y)

T2write(Y), T3read(Y)
T2write(Y), T3write(Y)
T2write(Y), T1read(Y)
T2write(Y), T1write(Y)

T2read(Y), T1write(Y)
T3read(Y), T1write(Y)

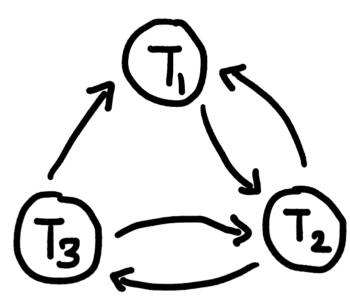
T1read(X), T2write(X)

T1write(X), T2read(X)
T1write(X), T2write(X)

T3write(Y), T1read(Y)
T3write(Y), T1write(Y)

T3write(Z), T2read(Z)

b) This schedule is not conflict-serializable, since there are cycles in its serialization graph.



d) T1 reads item Y which was modified earlier by T2, and T1 commits before T2, so it is not a recoverable schedule.

1. b)

Email -> Address
CardNumber, ExpiryDate -> Email, Address
CardNumber -> ExpiryDate
Name -> Price, Duration
Email, Name -> RentDuration, Discount, StartTime

c)

A primary key could be Email, CardNumber, Name. It is a candidate key for this relation, is unique, and cannot be reduced.

d)

This is not compliant with 2NF. The non-prime attribute ExpiryDate is dependent on just CardNumber, which is a subset of the primary key. We can decompose the relation as follows:

CardNumber, ExpiryDate
Email, CardNumber
Email, Address
Name, Price, Duration
Email, Name, RentDuration, Discount, StartTime

2. a)

3NF ???

b)

False. It is possible to have every non-prime attribute fully dependent on each candidate key. For example, we can have the relation (A, B, C) where A and B are candidate keys. So we have A -> BC, B -> AC. C is the only non-prime attribute. It is fully dependent on A, and fully dependent on B. Hence this is in 2NF.

c)

We have P -> CX, C -> PX. There are no transitive dependencies.

3. a)

Yes. We can have X -> C1. C1 is in a candidate key, so this does not violate 3NF. But X is not in {P, C1, C2}.

8. a)

```
select Event.EventName, count(TopicID)
from Event
join Covers on Event.EventID = Covers.EventID
group by EventID
```

c)

```
select Event.EventName, count(TopicID)
from Event
join Covers on Event.EventID = Covers.EventID
where substr(Event.EventName, 0, 1) == 'A'
group by EventID
```

d)

```
select Event.EventName, count(TopicID)
from Event
join Covers on Event.EventID = Covers.EventID
group by EventID
having count(TopicID) < 5
```

g)
```
select EventName
from Event
where not exists (
	select EventID
	from covers
	where Covers.EventID = Event.EventID
)
```

1. a)

(slide 17-18)

```
select SalaryGrades.HighestSal - Employees.salary
from SalaryGrades
join Employees on Employees.salary >= SalaryGrades.LowestSal and Employees.salary <= SalaryGrades.HighestSal
where Employees.EmpName = 'Smith'
```

b)
```
select EmpName
from Employees
where salary >= (
	select LowestSal
	from SalaryGrades
	where grade = 'G1'
)
and salary <= (
	select HighestSal
	from SalaryGrades
	where grade = 'G1'
)
```

7.

(slide 19)

i. Superkey

ii. None

8.

The program could error if someColumn is set to unique, and the update would try to set multiple rows to the same value.

9.

Yes. (Unless a column has a default)

4. b)
```
select model
from (
	(select model, price from PC)
	union
	(select model, price from Printer)
)
where price >= all (
	(select model, price from PC)
	union
	(select model, price from Printer)

)
```