

## **Problem 2**

1. There are 100,000 scans of R since its a linear comparison.
2. a. 2 R and 1 L
2. b.  $O(L \cdot \log(n) + J)$

## **Problem 3**

1. a decomposition is lossless if:

$$R1 \cap R2 \rightarrow R1 \cup (R1 \cap R2) \rightarrow R2$$

R1 is (A, B, C, F) and R2 is (A, D, E)

$$R1 \cap R2 \text{ — — — — } \rightarrow A$$

A is a key in the first relation in F. The relation is loss-less.

2. If it passes the vertical line test, it is functionally dependent  
 $C \text{ — — } \rightarrow A$ .  $C \text{ — — — } \rightarrow B$ .  $A \text{ — — — } \rightarrow B$ .

Need to find the unique pairs. Disregard the non-unique ones.

$$BC \text{ — — } \rightarrow A$$

$$AC \text{ — — } \rightarrow B$$

$$C \text{ — — } \rightarrow AB$$

3. To find candidate keys, find the keys that cannot be derived (not in the right hand side).

candidate keys: A, F

AF is not a key, so the relation is not in BCNF mode.

Decomposing it into R1(A,F) and R2(A,B,C,D,E)

C,E is in BCNF format

6.

meaning year, venue, band name are candidate keys.  
genre is non prime attribute.

this violates 2NF because genre is dependent on band name.

Since not in 2NF, it is not in 3NF.

7.

It is in 2NF because none of the columns are dependent on each other.

super keys = {venue}, {venue, year}, {venue, year, band}, {venue, year, band, attendees}

candidate keys = venue, band, year  
non prime keys = attendees

There is no transitive dependency. Thus, this is in 3NF.