

Ans a) Insertion Anomaly: It is not possible to insert the details of the customer if he not requesting a taxi. Inserting data of a new driver would result in entering null value in primary key (Job-id) value which is not possible.

Deletion Anomaly: Deleting the record of a client may also result in the loss of information about the driver, if that client was only client of that particular driver.

update Anomaly: If we update the driver details of with id 01, it has to be done at two places.

If we do the modification in the row with Job-id 1 and do not modify in Job-id 2, there will be inconsistency in the database.

Ans b) Driver Id → Driver Name, TaxId

client Id → client Name

Driver Name → Driver Id, TaxId

Driver Id, Driver Name → TaxId

Taxi Id, client Id → Job Pick up Address

Job Id → Job Date, Job Time

i) Assuming following abbreviations:-

Job Id → A

Driver Id → D

client Id → C

Job date → B

Driver Name → E

client Name → H

Job Time → J

Taxi Id → F

Job Pickup Add → I

Therefore

FD's are $D \rightarrow EF$, $G \rightarrow H$, $E \rightarrow DF$, $DE \rightarrow F$,
 $FG \rightarrow I$, $A \rightarrow BC$

\therefore Maximal cover of FD's is

$D \rightarrow E$, $G \rightarrow H$, $E \rightarrow D$, $FG \rightarrow I$, $A \rightarrow BC$

Normalized relation are:

clearly candidate key are $AFGD$ & $AFGE$

$R_1 (A \ B \ C)$

\therefore Here partial and transitive

$R_2 (F \ G \ I)$

dependencies are removed

$R_3 (E \ D)$

\therefore The table has been

$R_4 (G \ H)$

decomposed to 3NF

$R_5 (A \ F \ G \ D)$

$R_6 (A \ F \ G \ E)$

It supports lossless join as we have made
 separate table for candidate key and these
 keys relate to each relation given in the table
 \therefore it supports lossless join

ii) As we get earlier FD's were

$D \rightarrow EF$

$ED \rightarrow F$

$G \rightarrow H$

$FG \rightarrow I$

$E \rightarrow DF$

$A \rightarrow BC$

After normalisation to simplest form

CK \rightarrow AGE, AGD

After normalization we get 5 relations,

$R_1 (A B C)$

$R_2 (D E F)$

$R_3 (G H)$

$R_4 (F G I)$

$R_5 (A D G)$

Table has been decomposed to
BCNF form

Here, we didn't consider AGE as diff table because it does not consider with dependency and E is also not a superkey in any of the derived relation where D is a superkey in R_2