

Lab 9,10,11

FUNCTIONAL DEPENDENCIES AND NORMALISATION

- **Transaction_details** (TRA_ID, PID, AMOUNT, TRANSACTION_DATE, TRANSACTION_TIME)

$\{TRA_ID\} \rightarrow PID$

$\{TRA_ID\} \rightarrow AMOUNT$

$\{TRA_ID\} \rightarrow TRANSACTION_DATE$

$\{TRA_ID\} \rightarrow TRANSACTION_TIME$

CANDIDATE KEY: {TRA_ID}

PRIME ATTRIBUTE: TRA_ID

NON-PRIME ATTRIBUTE: PID, AMOUNT, TRANSACTION_DATE, TRANSACTION_TIME

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

- **Train** (TRAIN_ID, TRAIN_NAME, T_SOURCE, T_DESTINATION)

$\{TRAIN_ID\} \rightarrow TRAIN_NAME$

$\{TRAIN_ID\} \rightarrow T_SOURCE$

$\{TRAIN_ID\} \rightarrow T_DESTINATION$

CANDIDATE KEY: {TRAIN_ID}

PRIME ATTRIBUTE: TRAIN_ID

NON-PRIME ATTRIBUTE: TRAIN_NAME, T_SOURCE, T_DESTINATION

Normalization form:- 3 NF, BCNF

Reason:- For every FD $a \rightarrow b$ that holds on relation R so we can derive train name, source and destination from train id itself which is a superkey.

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- **Ticket** (TICKET_ID,PID, TRA_ID, TRAIN_ID)

$\{TICKET_ID\} \rightarrow TRA_ID$
 $\{TICKET_ID\} \rightarrow PID$
 $\{TICKET_ID\} \rightarrow TRAIN_ID$

CANDIDATE KEY: TICKET_ID

PRIME ATTRIBUTE: TICKET_ID

NON-PRIME ATTRIBUTE: TRA_ID, PID, TRAIN_ID

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

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- **P_EMAIL**(EMAIL,PID)

$\{EMAIL,PID\} \rightarrow EMAIL$
 $\{EMAIL,PID\} \rightarrow PID$

CANDIDATE KEY:{EMAIL,PID}

PRIME ATTRIBUTE:EMAIL,PID

NON-PRIME ATTRIBUTE: Null

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

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- **E_EMAIL**(EMAIL,EID)

$\{EMAIL,EID\} \rightarrow EMAIL$
 $\{EMAIL, EID\} \rightarrow EID$

CANDIDATE KEY:{EMAIL,EID}

PRIME ATTRIBUTE:EMAIL,EID

NON-PRIME ATTRIBUTE: Null

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

- **PARCELSERVICES** (PAR_ID, SID, SOURCE, DESTINATION)

$\{PAR_ID, SID\} \rightarrow SOURCE$

$\{PAR_ID, SID\} \rightarrow DESTINATION$

CANDIDATE KEY: {PAR_ID, SID}

PRIME ATTRIBUTE: PAR_ID, SID

NON-PRIME ATTRIBUTE: SOURCE, DESTINATION

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

- **EMPLOYEE** (EID, DEPARTMENT, AGE, FNAME, LNAME, DESIGNATION, PAN_NO, MOBILE_NO)

$\{EID\} \rightarrow DEPARTMENT$

$\{EID\} \rightarrow AGE$

$\{EID\} \rightarrow FNAME$

$\{EID\} \rightarrow LNAME$

$\{EID\} \rightarrow DESIGNATION$

$\{EID\} \rightarrow PAN_NO$

$\{EID\} \rightarrow MOBILE_NO$

$\{MOBILE_NO\} \rightarrow EID$

$\{\text{MOBILE_NO}\} \rightarrow \text{DEPARTMENT}$
 $\{\text{MOBILE_NO}\} \rightarrow \text{AGE}$
 $\{\text{MOBILE_NO}\} \rightarrow \text{FNAME}$
 $\{\text{MOBILE_NO}\} \rightarrow \text{LNAME}$
 $\{\text{MOBILE_NO}\} \rightarrow \text{DESIGNATION}$
 $\{\text{MOBILE_NO}\} \rightarrow \text{PAN_NO}$
 $\{\text{MOBILE_NO}\} \rightarrow \text{SID}$

$\{\text{PAN_NO}\} \rightarrow \text{EID}$
 $\{\text{PAN_NO}\} \rightarrow \text{DEPARTMENT}$
 $\{\text{PAN_NO}\} \rightarrow \text{AGE}$
 $\{\text{PAN_NO}\} \rightarrow \text{FNAME}$
 $\{\text{PAN_NO}\} \rightarrow \text{LNAME}$
 $\{\text{PAN_NO}\} \rightarrow \text{DESIGNATION}$
 $\{\text{PAN_NO}\} \rightarrow \text{MOBILE_NO}$
 $\{\text{PAN_NO}\} \rightarrow \text{SID}$

$\{\text{DEPARTMENT}\} \rightarrow \text{DESIGNATION}$

CANDIDATE KEY: {EID, MOBILE_NO, PAN_NO}

PRIME ATTRIBUTE: EID, MOBILE_NO, PAN_NO

NON-PRIME ATTRIBUTE: DEPARTMENT, AGE, FNAME, LNAME, DESIGNATION, SID

Normalization form:- 1NF

Reason:- A relation is a set of tuples, i.e. every tuple is distinct
Each value in a tuple is “atomic”

Insert Anomalies: To add a department or a designation, we have to add a dummy employee. Without employee department or designation cannot exist.

Delete Anomalies: If an employee leaves and he was the only one working at that designation then if we delete his record, then designation would also be deleted.

Update Anomalies: If the department of an employee changes and if we forgot to update his designation.

Normalization to 3NF BCNF

CREATE TABLE DEPARTMENT(DEP_ID, DEP_NAME)

{DEP_ID} → DEP_NAME

DDL:- CREATE TABLE DEPARTMENT(DEP_ID INTEGER PRIMARY KEY, DEP_NAME VARCHAR(30));

CREATE TABLE DESIGNATION(DES_ID, DES_NAME, DEP_ID(FK))

{DES_ID} → DES_NAME

DDL :- CREATE TABLE DESIGNATION(DES_ID INTEGER PRIMARY KEY, DES_NAME VARCHAR(30), DEP_ID INTEGER REFERENCES DEPARTMENT(DEP_ID));

EMPLOYEE(EID, AGE, FNAME, LNAME, PAN_NO, MOBILE_NO, SID(FK), DES_ID(FK))

{EID} → AGE

{EID} → FNAME

{EID} → LNAME

{EID} → PAN_NO

{EID} → MOBILE_NO

{EID} → SID

{EID} → DES_ID

{MOBILE_NO} → EID

{MOBILE_NO} → AGE

{MOBILE_NO} → FNAME

{MOBILE_NO} → LNAME

{MOBILE_NO} → PAN_NO

{MOBILE_NO} → SID

{MOBILE_NO} → DES_ID

{PAN_NO} → EID

{PAN_NO} → AGE

{PAN_NO} → FNAME

{PAN_NO} → LNAME

{PAN_NO} → MOBILE_NO

$\{PAN_NO\} \rightarrow SID$
 $\{PAN_NO\} \rightarrow DES_ID$

- **LOST AND FOUND** (ITEM_ID, ITEM_NAME, LOCATION, STATUS, ITEM_DESCRIPTION, SID)

$(ITEM_ID) \rightarrow ITEM_NAME$
 $\{ITEM_ID\} \rightarrow LOCATION$
 $\{ITEM_ID\} \rightarrow STATUS$
 $\{ITEM_ID\} \rightarrow ITEM_DESCRIPTION$
 $\{ITEM_ID\} \rightarrow SID$

CANDIDATE KEY: {ITEM_ID}

PRIME ATTRIBUTE: ITEM_ID

NON-PRIME ATTRIBUTE: ITEM_NAME, LOCATION, STATUS, ITEM_DESCRIPTION

Normalization form:- 3NF, BCNF

Reason:- For every FD $a \rightarrow b$ that holds on relation R so we can derive item name, location, status and item description from item id itself which is a superkey.

- **MEDICAL** (PATIENT_ID, PATIENT_NAME, ADDRESS, MOBILE_NO, DESCRIPTION)

$\{PATIENT_ID\} \rightarrow SID$
 $\{PATIENT_ID\} \rightarrow PATIENT_NAME$
 $\{PATIENT_ID\} \rightarrow ADDRESS$
 $\{PATIENT_ID\} \rightarrow MOBILE_NO$
 $\{PATIENT_ID\} \rightarrow DESCRIPTION$

$\{MOBILE_NO\} \rightarrow PATIENT_ID$
 $\{MOBILE_NO\} \rightarrow SID$
 $\{MOBILE_NO\} \rightarrow PATIENT_NAME$
 $\{MOBILE_NO\} \rightarrow ADDRESS$
 $\{MOBILE_NO\} \rightarrow DESCRIPTION$

CANDIDATE KEY: $\{PATIENT_ID, MOBILE_NO\}$

PRIME ATTRIBUTE: $PATIENT_ID, MOBILE_NO$

NON-PRIME ATTRIBUTE: $PATIENT_NAME, ADDRESS, DESCRIPTION$

Normalization form:- 3NF, BCNF

Reason:- For every FD $a \rightarrow b$ that holds on relation R so we can derive the patient name, address, mobile number and description from patient id itself which is a superkey.

- **STATION** ($SID, STATION_ALTITUDE, NAME, FOOD_AVAILABILITY, WAITING_ROOM_AVAILABILITY, TRAIN_ID$)

$\{SID\} \rightarrow STATION_ALTITUDE$
 $\{SID\} \rightarrow NAME$
 $\{SID\} \rightarrow FOOD_AVAILABILITY$
 $\{SID\} \rightarrow WAITING_ROOM_AVAILABILITY$
 $\{SID\} \rightarrow TRAIN_ID$

CANDIDATE KEY: $\{SID\}$

PRIME ATTRIBUTE: SID

NON-PRIME ATTRIBUTE: $STATION_ALTITUDE, NAME, FOOD_AVAILABILITY, WAITING_ROOM_AVAILABILITY, TRAIN_ID$

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

- **PASSENGER** (PID, GENDER, AGE, FNAME, LNAME, GOVT_ID, DOB, MOBILE_NO, SID)

$\{PID\} \rightarrow GENDER$
 $\{PID\} \rightarrow AGE$
 $\{PID\} \rightarrow FNAME$
 $\{PID\} \rightarrow LNAME$
 $\{PID\} \rightarrow GOVT_ID$
 $\{PID\} \rightarrow DOB$
 $\{PID\} \rightarrow MOBILE_NO$
 $\{PID\} \rightarrow SID$

$\{GOVT_ID\} \rightarrow GENDER$
 $\{GOVT_ID\} \rightarrow AGE$
 $\{GOVT_ID\} \rightarrow FNAME$
 $\{GOVT_ID\} \rightarrow LNAME$
 $\{GOVT_ID\} \rightarrow DOB$
 $\{GOVT_ID\} \rightarrow MOBILE_NO$
 $\{GOVT_ID\} \rightarrow SID$

$\{MOBILE_NO\} \rightarrow GENDER$
 $\{MOBILE_NO\} \rightarrow AGE$
 $\{MOBILE_NO\} \rightarrow FNAME$
 $\{MOBILE_NO\} \rightarrow LNAME$
 $\{MOBILE_NO\} \rightarrow DOB$
 $\{MOBILE_NO\} \rightarrow SID$

CANDIDATE KEY: {PID, GOVT_ID, MOBILE_NO}

PRIME ATTRIBUTE: PID, GOVT_ID, MOBILE_NO

NON-PRIME ATTRIBUTE: GENDER, AGE, FNAME, LNAME, DOB, SID

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

- **BOOKING DETAILS**(DEP_TIME, DEP_LOCATION, ARR_TIME, ARR_LOCATION, AVAILABILITY,PID,TRAIN_ID)

{TRAIN_ID, PID} → DEP_TIME
{TRAIN_ID, PID} → DEP_LOCATION
{TRAIN_ID, PID} → ARR_TIME
{TRAIN_ID, PID} → ARR_LOCATION
{TRAIN_ID, PID} → AVAILABILITY

CANDIDATE KEY: {TRAIN_ID, PID}

PRIME ATTRIBUTE: {TRAIN_ID, PID}

NON-PRIME ATTRIBUTE: DEP_TIME, DEP_LOCATION, ARR_TIME, ARR_LOCATION, AVAILABILITY, PID

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.

- **ARR_DEP_TIME**(TRAIN_ID,SID,ARRIVAL_TIME,DEPARTURE_TIME)

{TRAIN_ID,SID}→ ARRIVAL_TIME
{TRAIN_ID,SID}→ DEPARTURE_TIME

CANDIDATE KEY: {TRAIN_ID, SID}

PRIME ATTRIBUTE: {TRAIN_ID, SID}

NON-PRIME ATTRIBUTE: ARRIVAL_TIME,DEPARTURE_TIME

Normalization form:- 3 NF , BCNF

Reason:- A relation is in third normal form and BCNF, as there is no transitive dependency for non-prime attributes as well as it is in second normal form.
