**Group - 3\_13**

**Tiles Industry Database Project**

**Functional Dependencies (FD), Minimal FD Set,**

**Key Of Relation, Type Of Relation**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Utpal Busa - 202101193**

**Fenil Vaghasiya - 202101215**

**Krushang Bhoraniya - 202101175**

1. **Branch (branch\_no, branch\_name, city, owner\_name,**

**branch\_contact) :**

**FDs :**

branch\_no → branch\_name

branch\_no → owner\_name

branch\_no → branch\_contact

branch\_no → city

branch\_name → branch\_no

branch\_name → owner\_name

branch\_name → branch\_contact

branch\_name → city

→ In this relation two keys possible branch\_no and branch\_name but, we consider branch\_no so, in minimal fds branch\_no is the key.

**Minimal FDs :**

branch\_no → branch\_name

branch\_no → owner\_name

branch\_no → branch\_contact

branch\_no → city

**Key → branch\_no**

**Type → BCNF**

{**Reason :** Every attribute of Branch Relation is dependent only and only on Key of Relation (branch\_no)}

1. **Prod\_Stock (prod\_stc\_id, prod\_stc\_date, prod\_stc\_qty, branch\_no) :**

**FDs :**

{prod\_stc\_id, prod\_stc\_date} → prod\_stc\_qty

{prod\_stc\_id, prod\_stc\_date} → branch\_no

**Minimal FDs :**

{prod\_stc\_id, prod\_stc\_date} → prod\_stc\_qty

{prod\_stc\_id, prod\_stc\_date} → branch\_no

**Key → {prod\_stc\_id, prod\_stc\_date}**

**Type → BCNF**

{**Reason :** Every attribute of Prod\_Stock Relation is dependent only and only on Key of Relation (prod\_stc\_id, prod\_stc\_date)}

1. **Raw\_Mat\_Stock (rm\_stc\_id, rm\_stc\_date, rm\_stc\_qty, branch\_no) :**

**FDs :**

{rm\_stc\_id, rm\_stc\_date} → rm\_stc\_qty

{rm\_stc\_id, rm\_stc\_date} → branch\_no

**Minimal FDs** :

{rm\_stc\_id, rm\_stc\_date} → rm\_stc\_qty

{rm\_stc\_id, rm\_stc\_date} → branch\_no

**Key → {rm\_stc\_id, rm\_stc\_date}**

**Type → BCNF**

{**Reason :** Every attribute of Raw\_Mat\_Stock Relation is dependent only and only on Key of Relation (rm\_stc\_id, rm\_stc\_date)}

1. **Product (prod\_id, prod\_name, design, category, color, size, saleprice, description, branch\_no) :**

**FDs :**

prod\_id → prod\_name

prod\_id → design

prod\_id → category

prod\_id → color

prod\_id → size

prod\_id → saleprice

prod\_id → description

prod\_id → branch\_no

**Minimal FDs :**

prod\_id → prod\_name

prod\_id → design

prod\_id → category

prod\_id → color

prod\_id → size

prod\_id → saleprice

prod\_id → description

prod\_id → branch\_no

**Key : prod\_id**

**Type : BCNF**

**{Reason :** Every attribute of Product Relation is dependent only and only on Key of Relation (prod\_id)}

1. **Department (dep\_no, dep\_name, mgr\_id, branch\_no) :**

**FDs :**

dep\_no → dep\_name

dep\_no → mgr\_id

dep\_no → branch\_no

**Minimal FDs :**

dep\_no → dep\_name

dep\_no → mgr\_id

dep\_no → branch\_no

**Key : dep\_no**

**Type : BCNF**

{**Reason :** Every attribute of Department Relation is dependent only and only on Key of Relation (dep\_no)}

1. **Employee (emp\_id, emp\_name, email, city, age, gender, emp\_contact, salary, dep\_no) :**

**FDs :**

emp\_id → emp\_name

emp\_id → email

emp\_id → city

emp\_id → age

emp\_id → gender

emp\_id → emp\_contact

emp\_id → salary

emp\_id → dep\_no

**Minimal FDs :**

emp\_id → emp\_name

emp\_id → email

emp\_id → city

emp\_id → age

emp\_id → gender

emp\_id → emp\_contact

emp\_id → salary

emp\_id → dep\_no

**Key : emp\_id**

**Type : BCNF**

{**Reason :** Every attribute of Employee Relation is dependent only and only on Key of Relation (emp\_id)}

1. **Customer (cus\_no, cus\_name, street, city, pincode, state, country, cus\_contact, rating) :**

**FDs :**

cus\_no → cus\_name

cus\_no → cus\_city

cus\_no → cus\_contact

cus\_no → rating

cus\_no → street

cus\_no → city

cus\_no → pincode

cus\_no → state

cus\_no → country

**Minimal FDs :**

cus\_no → cus\_name

cus\_no → cus\_city

cus\_no → cus\_contact

cus\_no → rating

cus\_no → street

cus\_no → city

cus\_no → pincode

cus\_no → state

cus\_no → country

**Key : cus\_no**

**Type : BCNF**

{**Reason :** Every attribute of Customer Relation is dependent only and only on Key of Relation (cus\_no)}

1. **Order\_Info (ord\_no, ord\_date, purpose, cus\_no, prod\_id, prod\_qty, prod\_rate) :**

**FDs/Minimal FDs :**

ord\_no → ord\_date

ord\_no → purpose

ord\_no → cus\_no

{ord\_no, prod\_id} → prod\_qty

{ord\_no, prod\_id} → prod\_rate

**Key : {ord\_no, prod\_id}**

Here, first three FDs are violating the BCNF requirement. So, we have to

Decompose this relation and bring it to BCNF form.

Now, ord\_no+ = {ord\_no, ord\_date, purpose, cus\_no}

So, we decompose the Order\_Info Relation into two Relations Order and

Order\_Detail which are in BCNF.

**8.a) Order (ord\_no, ord\_date, purpose, cus\_no) :**

**FDs :**

ord\_no → ord\_date

ord\_no → purpose

ord\_no → cus\_no

**Minimal FDs :**

ord\_no → ord\_date

ord\_no → purpose

ord\_no → cus\_no

**Key : ord\_no**

**Type : BCNF**

{**Reason :** Every attribute of Order Relation is dependent only and only on Key of Relation (ord\_no)}

**8.b) Order\_Detail (ord\_no, prod\_id, prod\_qty, prod\_rate) :**

**FDs :**

{ord\_no, prod\_id} → prod\_qty

{ord\_no, prod\_id} → prod\_rate

**Minimal FDs :**

{ord\_no, prod\_id} → prod\_qty

{ord\_no, prod\_id} → prod\_rate

**Key : {ord\_no, prod\_id}**

**Type : BCNF**

{**Reason :** Every attribute of Order\_Detail Relation is dependent only and only on Key of Relation ({ord\_no, prod\_id})}

1. **Order\_Bill (bill\_no, bill\_date, order\_no, cus\_no, amount ) :**

**FDs :**

bill\_no → bill\_date

bill\_no → amount

bill\_no → order\_no

bill\_no → cus\_no

**Minimal FDs :**

bill\_no → bill\_date

bill\_no → amount

bill\_no → order\_no

bill\_no → cus\_no

**Key : bill\_no**

**Type : BCNF**

{**Reason :** Every attribute of Order\_Bill Relation is dependent only and only on Key of Relation (bill\_no)}

1. **Raw\_Material (rm\_id, rm\_name, branch\_no) :**

**FDs :**

rm\_id → rm\_name

rm\_id → branch\_no

**Minimal FDs :**

rm\_id → rm\_name

rm\_id → branch\_no

**Key : rm\_id**

**Type : BCNF**

{**Reason :** Every attribute of Raw\_Material Relation is dependent only and only on Key of Relation (rm\_id)}

1. **Raw\_Mat\_Detail (rm\_bill\_no, rm\_bill\_date, sup\_no, sup\_name,**

**street, city, pincode, state, country, sup\_contact) :**

**FDs/Minimal FDs :**

rm\_bill\_no → rm\_bill\_date

rm\_bill\_no → sup\_no

rm\_bill\_no → sup\_name

rm\_bill\_no → sup\_contact

rm\_bill\_no → sup\_city

sup\_no → sup\_name

sup\_no → street

sup\_no → city

sup\_no → pincode

sup\_no → state

sup\_no → country

sup\_no → sup\_contact

**Key : {rm\_bill\_no }**

Here,last three FDs are violating the BCNF requirement. So, we have to

Decompose this relation and bring it to BCNF form.

Now, sup\_no+ = {sup\_no, sup\_name, sup\_city, sup\_contact}

So, we decompose the Raw\_Mat\_Detail Relation into two Relations

Supplier and Raw\_Mat\_Bill which are in BCNF.

**11.a) Supplier (sup\_no, sup\_name, street, city, pincode, state,**

**country, sup\_contact) :**

**Minimal FDs :**

sup\_no → sup\_name

sup\_no → sup\_contact

sup\_no → street

sup\_no → city

sup\_no → pincode

sup\_no → state

sup\_no → country

sup\_no → sup\_contact

**Key : sup\_no**

**Type : BCNF**

{**Reason :** Every attribute of Supplier Relation is dependent only and

only on Key of Relation (sup\_no )}

**11.b) Raw\_Mat\_Bill (rm\_bill\_no, rm\_bill\_date, sup\_no) :**

**Minimal FDs :**

rm\_bill\_no → rm\_bill\_date

rm\_bill\_no → sup\_no

**Key : rm\_bill\_no**

**Type : BCNF**

{**Reason :** Every attribute of Raw\_Mat\_Bill Relation is dependent only and only on Key of Relation (rm\_bill\_no)}

1. **Purchase\_Detail (rm\_bill\_no, rm\_id, rm\_volume, rm\_rate) :**

**FDs :**

{rm\_bill\_no, rm\_id} → rm\_volume

{rm\_bill\_no, rm\_id} → rm\_rate

**Minimal FDs :**

{rm\_bill\_no, rm\_id} → rm\_volume

{rm\_bill\_no, rm\_id} → rm\_rate

**Key : {rm\_id, rm\_bill\_no}**

**Type : BCNF**

{**Reason :** Every attribute of Purchase\_Detail Relation is dependent only and only on Key of Relation ({rm\_id, rm\_bill\_no})}

1. **Used\_Raw\_Material (prod\_id, rm\_id) :**

**FDs :**  No FDs present in this relation, because all attributes are combined

generate Primary Key. Hence, this relation is also in BCNF.

**Key : {prod\_id, rm\_id}**

**Type : BCNF**

**DDL Script :**

**create schema Tiles\_Industry\_Database\_Project;**

**set search\_path to Tiles\_Industry\_Database\_Project;**

**1)---------- Branch ----------**

**create table Branch(**

**branch\_no int,**

**branch\_name varchar(20),**

**owner\_name varchar(30),**

**branch\_contact varchar(10) ,**

**city varchar(30),**

**primary key(branch\_no)**

**);**

**2)---------- Department ----------**

**create table Department(**

**dep\_no int,**

**dep\_name varchar(40),**

**mgr\_id varchar(20),**

**branch\_no int,**

**primary key(dep\_no),**

**foreign key(branch\_no) references Branch(branch\_no)**

**on update cascade**

**on delete cascade**

**);**

**3)---------- Employee ----------**

**create table Employee(**

**emp\_id varchar(20),**

**emp\_name varchar(30),**

**email varchar(50),**

**city varchar(30),**

**age int,**

**gender varchar(10),**

**emp\_contact varchar(10),**

**salary int,**

**dep\_no int,**

**primary key(emp\_id),**

**foreign key(dep\_no) references Department(dep\_no)**

**on update cascade**

**on delete cascade**

**);**

**4)---------- Product ----------**

**create table Product(**

**prod\_id varchar(20),**

**prod\_name varchar(40),**

**design varchar(40),**

**category varchar(30),**

**color varchar(30),**

**size varchar(20),**

**saleprice float,**

**description varchar(60),**

**branch\_no int,**

**primary key(prod\_id),**

**foreign key(branch\_no) references Branch(branch\_no)**

**on update cascade**

**on delete cascade**

**);**

**5)---------- Raw\_Material ----------**

**create table Raw\_Material(**

**rm\_id varchar(20),**

**rm\_name varchar(40),**

**branch\_no int,**

**primary key(rm\_id),**

**foreign key(branch\_no) references Branch(branch\_no)**

**on update cascade**

**on delete cascade**

**);**

**6)---------- Supplier ------------**

**create table Supplier(**

**sup\_no int,**

**sup\_name varchar(30),**

**street varchar(50),**

**city varchar(30),**

**pincode varchar(30),**

**state varchar(30),**

**country varchar(30),**

**sup\_contact varchar(10),**

**primary key(sup\_no)**

**);**

**7)---------- Raw\_Mat\_Bill ----------**

**create table Raw\_Mat\_Bill(**

**rm\_bill\_no int primary key,**

**rm\_bill\_date DATE ,**

**sup\_no int,**

**foreign key(sup\_no) references Supplier(sup\_no)**

**on update cascade**

**on delete cascade**

**);**

**8)---------- Purchase\_Detail ----------**

**create table Purchase\_Detail(**

**rm\_bill\_no int,**

**rm\_id varchar(20),**

**rm\_qty int,**

**rm\_rate float,**

**primary key(rm\_bill\_no,rm\_id),**

**foreign key(rm\_bill\_no) references Raw\_Mat\_Bill(rm\_bill\_no)**

**on update cascade**

**on delete cascade,**

**foreign key(rm\_id) references Raw\_Material(rm\_id)**

**on update cascade**

**on delete cascade**

**);**

**9)---------- Customer ----------**

**create table Customer(**

**cus\_no int primary key,**

**cus\_name varchar(30),**

**street varchar(50),**

**city varchar(30),**

**pincode varchar(30),**

**state varchar(30),**

**country varchar(30),**

**cus\_contact varchar(10),**

**rating float**

**);**

**10)---------- Order\_Table (Order) ----------**

**create table Order\_Table(**

**ord\_no int primary key,**

**ord\_date DATE,**

**purpose varchar(50),**

**cus\_no int,**

**foreign key(cus\_no) references Customer(cus\_no)**

**on update cascade**

**on delete cascade**

**);**

**11)---------- Order\_Detail ----------**

**create table Order\_Detail(**

**ord\_no int,**

**prod\_id varchar(20),**

**prod\_qty int ,**

**prod\_rate float,**

**primary key(ord\_no,prod\_id),**

**foreign key(ord\_no) references Order\_Table(ord\_no)**

**on update cascade**

**on delete cascade,**

**foreign key(prod\_id) references Product(prod\_id)**

**on update cascade**

**on delete cascade**

**);**

**12)---------- Order\_Bill ----------**

**create table Order\_Bill(**

**bill\_no int primary key,**

**bill\_date DATE,**

**amount float,**

**ord\_no int,**

**cus\_no int,**

**foreign key(ord\_no) references Order\_Table(ord\_no)**

**on update cascade**

**on delete cascade,**

**foreign key(cus\_no) references Customer(cus\_no)**

**on update cascade**

**on delete cascade**

**);**

**13)---------- Used\_Raw\_Material ----------**

**create table Used\_Raw\_Material(**

**prod\_id varchar(20),**

**rm\_id varchar(20),**

**primary key(prod\_id, rm\_id),**

**foreign key(prod\_id) references Product(prod\_id)**

**on update cascade**

**on delete cascade,**

**foreign key(rm\_id) references Raw\_Material(rm\_id)**

**on update cascade**

**on delete cascade**

**);**

**14)---------- Prod\_Stock ----------**

**create table Prod\_Stock(**

**prod\_stc\_id varchar(20),**

**prod\_stc\_date DATE,**

**prod\_stc\_qty int,**

**branch\_no int,**

**primary key(prod\_stc\_id, prod\_stc\_date),**

**foreign key(branch\_no) references Branch(branch\_no)**

**on update cascade**

**on delete cascade**

**);**

**15)---------- Raw\_Mat\_Stock ----------**

**create table Raw\_Mat\_Stock(**

**rm\_stc\_id varchar(20),**

**rm\_stc\_date DATE,**

**rm\_stc\_qty int,**

**branch\_no int,**

**primary key(rm\_stc\_id, rm\_stc\_date),**

**foreign key(branch\_no) references Branch(branch\_no)**

**on update cascade**

**on delete cascade**

**);**