**Group - 3\_13**

**Tiles Industry Database Project**

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

**Key Of Relation, Type Of Relation**

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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**