**BCNF (Boyce – Codd normal form)**

Boyce-Codd normal form (BCNF) is a normal form used in database normalization. It is a slightly rigid version of the third normal form (3NF).

BCNF was developed in 1974 by Raymond F. Boyce and Edgar F. Codd to address certain types of anomalies not dealt with by 3NF as originally defined.

A relation is in BCNF if every determinant α is a candidate key. A determinant is any attribute whose value determines other values within a row. A candidate key is a minimal set of attributes that can uniquely identify each tuple in a relation.

**1)Orders:**

# R(Oid,Cid,Date)

|  |
| --- |
| **Minimal FDs:**    Oid→Cid Oid→Date |
| (Oid)+=R(Oid,Cid,Date)  Hence Oid is the key |
| **BCNF Proof**:    -No multivalue or composite attribute.  -No transitive dependency  -No partial dependency  -Oid is the super key    Oid is the super key present on the left side of each FD, hence the relation is in BCNF. |

**2) Dabba:**

# R(Did,SScode,SDcode,DScode,DDcode,Express\_tower,Florr\_no)

|  |
| --- |
| **Minimal FDs:**  Did→SScode  Did→SDcode  Did→DScode  Did→DDcode  Did→Express\_tower  Did→Florr\_no |
| (Did)+=R(Did,SScode,SDcode,DScode,DDcode,Express\_tower,  Floor\_no)  Hence Did is the Key. |
| **BCNF Proof**:    -No multivalue or composite attribute.  -No transitive dependency  -No partial dependency  -Did is the super key    Did is the super key present on the left side of each FD, hence the relation is in BCNF. |

**3) Dabbawala:**

# R(Dwid,Did,D\_Fname,D\_Mname,D\_Lname,Gender,DOJ,Contact\_no)

|  |
| --- |
| **Minimal FDs:**  Dwid→Dw\_Fname  Dwid→ Dw\_Mname Dwid→ Dw\_Lname  Dwid→ Gender  Dwid→ DOJ  Dwid→ Contact\_no |
| (Dwid,did)+=R(Dwid,Did,D\_Fname,D\_Mname,D\_Lname,Gender,DOJ, contact\_no)  Hence Dwid,did is the key. |
| **BCNF Proof**:    **-**Did was a multivalue attribute so we split it in different tuples during insertion.  -No transitive dependancies  -No partial dependency -Dwid,Did is the candidate key    In every FD the left side attribute is a super key so the table is in BCNF. |

# Customer

## R(Cid,C\_Fname,C\_Mname,C\_Lname,Did,Desti\_address, Contact\_no,credit,debt)

|  |
| --- |
| **Minimal FDs:**    Cid→C\_Fname  Cid→C\_Mname  Cid→C\_Lname  Cid→Did  Cid→Desti\_address  Cid→Contact\_no  Cid→credit  Cid→debt |
| (Cid)+=R(Cid,C\_Fname,C\_Mname,C\_Lname,Did,Desti\_address, Contact \_no,credit,debt) Hence Cid is the key. |
| **BCNF Proof**:    -No multivalue or composite attribute.  -No transitive dependency  -No partial dependency  -Cid is the super key    Cid is the super key present on the left side of each FD, hence the relation is in BCNF. |

# Payment

## R(Tid,Oid,Date,Amount,Cid)

|  |
| --- |
| **Minimal FDs:**    Tid→Oid  Tid→Date  Tid→Amount  Tid→Cid  Oid→Tid |
| (Tid,Oid)+=R(Tid,Oid,Date,Amount,Cid) Hence Tid,Oid are the keys. |
| **BCNF Proof**:    -No multivalue or composite attribute.  -No transitive dependency  -No partial dependency  -Cid is the super key    Cid is the super key present on the left side of each FD, hence the relation is in BCNF. |

# Donation

## R(DTranid,Cid,D\_Fname,D\_Mname,D\_Lname,Amount,Date, Contact\_no)

|  |
| --- |
| **Minimal FDs:**    Dtranid→Cid  Dtranid→D\_Fname  Dtranid→D\_Mname  Dtranid→D\_Lname  Dtranid→Amount  Dtranid→Date  Dtranid→Contact\_no |
| (Dtranid)+=R(DTranid,Cid,D\_Fname,D\_Mname,D\_Lname,Amount,  Date,Contact\_no)  Hence Dtranid is the key |
| **BCNF Proof**:    -No multivalue or composite attribute.  -No transitive dependency  -No partial dependency  -Dtranid is the super key    Dtranid is the super key present on the left side of each FD, hence the relation is in BCNF |

# 7)Holiday

## R(Dwid,Reason,hdate)

|  |
| --- |
| **Minimal FDs:**    (DWid,Reason,hdate) → DWid  (DWid,Reason,hdate) → Reason  (DWid,Reason,hdate) → hdate |
| (DWid,Reason,hdate)+=R(DWid,reason.hdate) Hence DWid,hdate are the candidate keys. |
| **BCNF Proof**:    **-** No multivalue or composite attributes  -No transitive dependancies  -No partial dependency  -Dwid,hdate is the candidate key    In every FD the left side attribute is a super key so the table is in BCNF. |

# 8)Punishment

## R(Dwid,Reason,Punishment,Date,Status)

|  |
| --- |
| **Minimal FDs:**    (Dwid,Reason,date) → punishment (Dwid,Reason,date) → status |
| (Dwid,Reason,date)+=R(Dwid,Reason,Punishment,Date,Status) Hence Dwid,Reason and date together is the composite key. |
| **BCNF Proof:**    **-**Reason was a multivalue attribute so we split it in different tuples during insertion.  -No transitive dependancies  -No partial dependency  -Dwid,Reason,date is the candidate key    In every FD the left side attribute is a super key so the table is in BCNF. |