



Database Management System (IT214)

NirvachanPrabandhan (Election Management System)

Group – 05

Group Name:

ElectroCrats (Electoral + Technocrats)

Group Members:

1. Jainesh Patel (202301446) (Group Representative)
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Functional Dependency and Minimal FD Sets and Proof of BCNF:-

1. State

State (State_Name)

- **Minimal FD Set:**
 - $\text{State_Name} \rightarrow \{\}$
- **Key:** State_Name
- **BCNF:** Yes (only one attribute and it's the key), because all FDs have key on it's left side.

2. Constituency

Constituency(Constituency_ID, Constituency_Name, Reserved_Category, State_Name)

- **Minimal FD Set:**
 - $\text{Constituency_ID} \rightarrow \text{Constituency_Name}, \text{Reserved_Category}, \text{State_Name}$
- **Key:** Constituency_ID
- **BCNF:** Yes , because all FDs have key on it's left side.

3. Polling_Booth

Polling_Booth(Polling_Booth_ID, Booth_Name, Constituency_ID, Location)

- **Minimal FD Set:**
 - $\text{Polling_Booth_ID} \rightarrow \text{Booth_Name}, \text{Constituency_ID}, \text{Location}$
- **Key:** Polling_Booth_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

4. Voters

Voters(Voter_ID, Name, DOB, Gender, Aadhar_Number, Email, Residence_Address, Phone_Number, Voter_Status, Polling_Booth_ID)

- **Minimal FD Set:**
 - $\text{Voter_ID} \rightarrow \text{Name}, \text{DOB}, \text{Gender}, \text{Aadhar_Number}, \text{Email}, \text{Residence_Address}, \text{Phone_Number}, \text{Voter_Status}, \text{Polling_Booth_ID}$
 - $\text{Aadhar_Number} \rightarrow \text{Voter_ID}$ (since it's unique)
- **Key:** Voter_ID or Aadhar_Number
- **BCNF:** Yes, because all FDs have key on it's left side.

5. Election

Election(Election_ID, Election_Name, Start_Date, End_Date, Result_Date, No_of_Phases, Status)

- **Minimal FD Set:**
 - Election_ID → Election_Name, Start_Date, End_Date, Result_Date, No_of_Phases, Status
- **Key:** Election_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

6. Parties

Parties(Party_ID, Party_Name, Party_Symbol, Party_Recognition, President, Contact_Info, Foundation_Date, Headquarters)

- **Minimal FD Set:**
 - Party_ID → Party_Name, Party_Symbol, Party_Recognition, President, Contact_Info, Foundation_Date, Headquarters
- **Key:** Party_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

7. Candidate

Candidate(Candidate_ID, Voter_ID, Nomination_Constituency, Party_ID, Election_ID, Educational_Qualification, Liabilities_Value, Assets_Value, Criminal_Record, Nomination_Status, Category, Total_Funds_Received, Total_Expenditure, Legal_Limit_Exceeded, No_of_Votes, Affidavit_document)

- **Minimal FD Set:**
 - Candidate_ID → Voter_ID, Nomination_Constituency, Party_ID, Election_ID, Educational_Qualification, Liabilities_Value, Assets_Value, Criminal_Record, Nomination_Status, Category, Total_Funds_Received, Total_Expenditure, Legal_Limit_Exceeded, No_of_Votes, Affidavit_document
- **Key:** Candidate_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

8. Election_Phase

Election_Phase(Election_ID, Phase_No, Gazette_Issue_Date, Nomination_Scrutiny_Date, Withdrawal_Last_Date, Polling_Date, Counting_Date)

- **Minimal FD Set:**
 - (Election_ID, Phase_No) → Gazette_Issue_Date, Nomination_Scrutiny_Date, Withdrawal_Last_Date, Polling_Date, Counting_Date
- **Key:** (Election_ID, Phase_No)

- **BCNF:** Yes, because all FDs have key on it's left side.

9. Election_Schedule

Election_Schedule(Constituency_ID, Election_ID, Phase_No)

- **Minimal FD Set:**
 - (Constituency_ID, Election_ID) → Phase_No
- **Key:** (Constituency_ID, Election_ID)
- **BCNF:** Yes, because all FDs have key on it's left side.

10. Booth_Election

Booth_Election(Booth_ID, Election_ID)

- **Minimal FD Set:**
 - (Booth_ID, Election_ID) → {} or \emptyset
- **Key:** (Booth_ID, Election_ID)
- **BCNF:** Yes, because all FDs have key on it's left side.

11. Support_Staff

Support_Staff(Staff_ID, Contact_No, Email, Work_Department, Work_Office_Add, Status)

- **Minimal FD Set:**
 - Staff_ID → Contact_No, Email, Work_Department, Work_Office_Add, Status
- **Key:** Staff_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

12. Employed_At

Employed_At(Staff_ID, Booth_ID, Election_ID, Duty_Type, Duty_Start_Date, Duty_End_Date, Allowance)

- **Minimal FD Set:**
 - (Staff_ID, Booth_ID, Election_ID) → Duty_Type, Duty_Start_Date, Duty_End_Date, Allowance
- **Key:** (Staff_ID, Booth_ID, Election_ID)
- **BCNF:** Yes, because all FDs have key on it's left side.

13. EVM_VVPAT

EVM_VVPAT(Device_ID, Machine_Type, Last_Serviced, Status)

- **Minimal FD Set:**
 - Device_ID → Machine_Type, Last_Serviced, Status
- **Key:** Device_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

14. DEPLOYED_AT

DEPLOYED_AT(Device_ID, Booth_ID, Election_ID)

- **Minimal FD Set:**
 - (Device_ID, Booth_ID, Election_ID) → ∅
- **Key:** (Device_ID, Booth_ID, Election_ID)
- **BCNF:** Yes, because all FDs have key on it's left side.

15. Vote

Vote(Voter_ID, Election_ID, Status)

- **Minimal FD Set:**
 - (Voter_ID, Election_ID) → Status
- **Key:** (Voter_ID, Election_ID)
- **BCNF:** Yes, because all FDs have key on it's left side.

16. Postal_Voting

Postal_Voting(Postal_Vote_ID, Voter_ID, Status)

- **Minimal FD Set:**
 - Postal_Vote_ID → Voter_ID, Status
- **Key:** Postal_Vote_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

17. Complaints

Complaints(Complaint_ID, Complaint_Type, Complaint_Description, Complaint_Status, Election_ID, Filed_Date, Resolved_Date, Voter_ID, Booth_ID)

- **Minimal FD Set:**
 - Complaint_ID → Complaint_Type, Complaint_Description, Complaint_Status, Election_ID, Filed_Date, Resolved_Date, Voter_ID, Booth_ID

- **Key:** Complaint_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

18. Employee

Employee(Officer_ID, Voter_ID, Designation, Office_Add, Status, Office_Contact_No, Office_Email, Appointment_Date, Tenure_End_Date, Salary, Employee_Type)

- **Minimal FD Set:**
 - Officer_ID → Voter_ID, Designation, Office_Add, Status, Office_Contact_No, Office_Email, Appointment_Date, Tenure_End_Date, Salary, Employee_Type
- **Key:** Officer_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

19. State_Level_Officer

State_Level_Officer(Officer_ID, State_Name)

- **Minimal FD Set:**
 - Officer_ID → State_Name
- **Key:** Officer_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

20. National_Level_Officer

National_Level_Officer(Officer_ID)

- **Minimal FD Set:**
 - Officer_ID → \emptyset
- **Key:** Officer_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

21. Constituency_Level_Officer

Constituency_Level_Officer(Officer_ID, Constituency_ID)

- **Minimal FD Set:**
 - Officer_ID → Constituency_ID
- **Key:** Officer_ID
- **BCNF:** Yes, because all FDs have key on it's left side.

22. Booth_Level_Officer

Booth_Level_Officer(Officer_ID, Booth_ID)

- **Minimal FD Set:**
 - Officer_ID \rightarrow Booth_ID
- **Key:** Officer_ID
- **BCNF:** Yes, because all FDs have key on it's left side.