# LAB 3- Normalization

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Ques 1. Database Anomalies captures Consider the following relation with sample data. The AIRPORT KLX Table the data about daily departing flights at the KLX Airport.

• Each airline operating at KLX airport has a unique Airline ID and an Airline Name.

• Each terminal at KLX airport has a unique Terminal ID and a fixed Number of Gates.

• Each airline is permanently assigned to one (and only one) terminal at the KLX Airport.

• Each terminal at KLX Airport can have multiple airlines assigned to it.

• Each day (Date), this table records the Number of Departing Flights at KLX Airport for each airline.

1. Using the Airport KLX Table, describe an example that illustrates the insertion anomaly.

ANS: INSERT record of airline at TerminalID A.

Adding UA airlineID at terminal A

2. Using the AIRPORT KLX Table, describe an example that illustrates the deletion anomaly.

ANS: DELETE record of airline on 11-Dec.

Deleting the Airline on 11-Dec which has 20 Gates.

3. Using the AIRPORT KLX Table, describe an example that illustrates the modification anomaly.

ANS:  Assigning terminalID B to airline with AirlineID UA.

4. In the AIRPORT KLX Table, identify

a) Full (key) Functional Dependencies

ANS: AirlineID→AirlineName

   TerminalID→ NumberOfGates

b) Partial (key) Functional Dependencies (if any)

Date → AirlineID

c) Transitive Functional Dependencies (if any).

ANS: No transitive dependency

5. Normalize AIRPORT KLX relation up to BCNF.

ANS: Converting to 2NF

| TerminalID | NumberOfGates |
|------------|---------------|
| A | 20 |
| B | 15 |
| C | 15 |

| Date | AirlineID | AirlineName | TerminalID | NumberOfDepartingFlights |
|------|-----------|-------------|------------|--------------------------|
| 11-Dec | UA | United | A | 34 |
| 11-Dec | NW | Northwest | A | 17 |
| 11-Dec | AA | American | A | 11 |
| 11-Dec | DL | Delta | B | 20 |
| 11-Dec | JB | Jet Blue | B | 6 |
| 12-Dec | UA | United | A | 29 |
| 12-Dec | DL | Delta | B | 20 |
| 12-Dec | SWA | Southwest | C | 17 |

CONVERTING TO 3NF

| AirlineNo. | AirlineID | AirlineName | TerminalID |
|------------|-----------|-------------|------------|
| 1 | UA | United | A |
| 2 | NW | Northwest | A |
| 3 | AA | American | A |

| 4 | DL | Delta | B |
| 5 | JB | Jet Blue | B |
| 6 | SWA | Southwest | c |

| Date | AirlineNo. | NumberOfDepartingFlights |
| --- | --- | --- |
| 11-Dec | 1 | 34 |
| 11-Dec | 2 | 17 |
| 11-Dec | 3 | 11 |
| 11-Dec | 4 | 20 |
| 11-Dec | 5 | 6 |
| 12-Dec | 1 | 29 |
| 12-Dec | 4 | 20 |
| 12-Dec | 6 | 17 |

| TerminalID | NumberOfGates |
| --- | --- |
| A | 20 |
| B | 15 |
| C | 15 |

This is in BCNF as well.

Ques 2. Finding Keys and Normalization Consider the following relation scheme and FDs:

Employee (EmpID, EmpName, Specialization, ManagerID, ProjID, ProjTitle, SupervisorName, SupervisorLocation, Bonus)

Given the following functional dependencies:

1) EmpID→EmpName

2) ProjID→ProjTitle, SupervisorName

3) SupervisorName→SupervisorLocation

4) {EmpID, ProjID, Specialization} → Bonus

5) {EmpID, Specialization} → ManagerID

6) ManagerID → Specialization

Answer the following questions:

1) Find all keys (candidate keys) (Hint: there are 2 candidate keys, both are composite keys)

ANS:Candidate keys are

 EmpID, Specialization, ProjID, SupervisorLocation

 EmpID, ManagerID, ProjID, SupervisorLocation

2) Normalize this relation up to BCNF (explain all steps of your normalization, mention functional dependencies to justify the normalization process)

ANS: This relation is in 1NF and we need to convert it to 2NF:

EmpInfo(EmpID, EmpName)

Relation(EmpID, Specialization, ManagerID, ProjID)

ProjInfo(ProjID, ProjTitle, SupervisorName, SupervisorLocation )

This is in 2NF now.