**Normalization of Schemas**

**Group members**

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1. **Users Schema**

Functional Dependencies:

1. user\_id 🡪 address
2. user\_id 🡪 name
3. user\_id 🡪 phone\_no
4. phone\_no 🡪 name

For 1NF, decomposing the multivalued attributes i.e name and phone\_no into atomic values.

The candidate key in user\_id. There are no partial dependencies in the relation. Thus table is in 2NF.

The table is not in 3NF as there are transitive dependencies. Decomposing the schema into 3NF

R1 (user\_id, name,address)

R2 (user\_id, phone\_no)

R3 (phone\_no, name)

The schema is now decomposed to 3NF thus there are no partial and transitive dependencies in the schema.

1. **Shifts Schema**

Functional Dependencies are:

1. shift\_id 🡪 start
2. shift\_id 🡪 end

There are no non-atomic attributes. Hence the schema is in 1NF. The candidate key is shift\_id and there are no partial dependencies. Thus the schema is also in 2NF. There are no transitive dependencies also. Thus the schema is in 3NF.

Thus the normalised relation schema is

R (shift\_id, start, end)

1. **Location Schema**

Functional dependencies:

1. Zipcode 🡪 loc\_name

There are no non-atomic attributes and the candidate key is zipcode. The schema does not have any partial or transitive dependencies. Hence the schema is in 3NF.

The normalised relation schema is:

R (zipcode, loc\_name)

1. **Drivers Schema**

Functional Dependencies:

1. driver\_id 🡪 rating
2. driver\_id 🡪 d\_name
3. driver\_id 🡪 d\_phone\_no
4. driver\_id 🡪 taxi\_id
5. d\_phone\_no 🡪 d\_name

Candidate key is driver\_id. There are multivalued and composite attributes in d\_name and d\_phone\_no. Decomposing these to the atomic forms gives the 1NF of the schema. There are no partial dependencies in the schema as the size of the candidate key is 1. Thus the schema is in 2NF. There are transitive dependencies. He schema can be decomposed as:

R1 (driver\_id, d\_name, d\_phone\_no, taxi\_id, rating)

R2 (driver\_id, d\_phone\_no)

R3 (d\_phone\_no, d\_name)

1. **Garage Schema**

Functional Dependencies:

1. garage\_id, taxi\_id 🡪 status

Candidate key of the weak entity set is garage\_id and it is dependant on the strong entity set taxi\_id. There are no non-atomic attributes and hence the table is in 1NF. There are no partial or transitive dependencies hence the table is in 2NF and 3NF.

The schema becomes:

Garage (garage\_id, taxi\_id, status)

1. **Taxi schema**

Functional Dependencies:

1. taxi\_id 🡪 color
2. taxi\_id 🡪 model
3. taxi\_id 🡪 number
4. model 🡪 capacity
5. model 🡪 class
6. taxi\_id 🡪 driver\_id

The attribute class and model are non-atomic and decomposing them into atomic values gives the schema in 1NF. The candidate key is taxi\_id. There are no partial dependencies. The schema is in 2NF. There are transitive dependencies and decomposing the schema further gives the 3NF of the schema:

R1 (taxi\_id, color, number, driver\_id )

R2 (taxi\_id, model)

R3 (model, capacity, class)

1. **Trips schema**

Functional Dependencies are:

1. trip\_id, start, end 🡪 duration
2. trip\_id, class 🡪 fare
3. trip\_id 🡪 rating
4. trip\_id 🡪 status
5. trip\_id 🡪 taxi\_id
6. taxi\_id 🡪 driver\_id
7. trip\_id 🡪 user\_id

Candidate key is (trip\_id)

There are no non-atomic attributes and hence the table is in 1NF. There are partial dependencies and hence decomposing the schema gives:

There is a transitive dependency and we further decompose the schemas to get the 3NF.

R1 (trip\_id, start, end, duration)

R2 (trip\_id , from, to, duration, fare)

R3 (trip\_id, from, to, user\_id)

R4 (trip\_id, rating, status, taxi\_id, driver\_id)

1. **Books schema**

No functional dependencies. The schema is in 3NF

Books (user\_id, to, from, start, end )

1. **Works schema**

No functional dependencies. The schema is in 3NF

Works (driver\_id, shift\_id)

1. **Drives schema**

No functional dependencies. The schema is in 3NF

Drives (driver\_id, taxi\_id)

1. **Availability schema**

No functional dependencies. The schema is in 3NF

Availability (taxi\_id, zipcode)

1. **Present\_At schema**

No functional dependencies. The schema is in 3NF

Present\_At (driver\_id, zipcode)

1. **Used\_For schema**

No functional dependencies. The schema is in 3NF

Used\_For (taxi\_id, trip\_id)

1. **Contains schema**

No functional dependencies. The schema is in 3NF

Contains (taxi\_id, garage\_id)

**ER Diagram**

