

Exercise 14.16

(a)

Insertion anomalies: You cannot insert a new hotel until at least one staff member is assigned to it.

Delete anomalies: Deleting the last record of a staff working at a hotel may remove all traces of that hotel from the table.

Modification anomalies: If a hotel changes its name, you must update every occurrence. If one is missed, inconsistent data appears.

(b) Functional dependency are:

$NIN \rightarrow eName$

$hNo \rightarrow hLoc$

$NIN, hNo, contractNo \rightarrow hours$

Assumptions:

- A staff member (NIN) works at only one hotel at a time.
- hLoc doesn't repeat across different hNo.

(c) To normalize the table to 3NF

Step 1: First Normal Form (1NF)

The original table seems to be in 1NF, no repeating groups or arrays.

Step 2: Second Normal Form (2NF)

Remove partial dependencies (attributes depending only on part of the composite key).

Create separate tables:

1. **Staff**

NIN (PK), eName

2. **Hotel**

hNo (PK), HotelName

3. **Contract**

contractNo (PK), description

4. **Assignment**

NIN (FK), HotelNo (FK), contractNo (FK), hours

Step 3: Third Normal Form (3NF)

Already in 3NF because:

- No transitive dependencies (non-key attributes depending on other non-key attributes)
- All attributes in each table are dependent on the key, the whole key, and nothing but the key.

Keys

- **Primary Keys:**
 - Staff → NIN
 - Hotel → hNo
 - Contract → contractNo
 - Assignment → NIN + hNo + contractNo
- **Foreign Keys:**
 - Assignment.NIN → Staff.NIN
 - Assignment.HotelNo → Hotel.hNo
 - Assignment.contractNo → Contract.contractNo