**Normalization and BCNF – Assignment 8**

### **Customer Table**

**Functional Dependencies:**

* Customer\_ID → F\_Name, L\_Name, Address, Email, C\_Points, C\_Gifts, C\_History
* Email → Customer\_ID (assuming Email is unique per customer)

**Analysis for BCNF:**

* Customer\_ID as Superkey: Since Customer\_ID is the primary key, it uniquely identifies each row in the table. This satisfies the primary requirement for BCNF, where every determinant must be a superkey.
* Email as Alternate Key: Assuming each email is unique, Email also serves as a candidate key. Since it is functionally determining Customer\_ID, this relationship does not violate BCNF as both are candidate keys.
* No Partial or Transitive Dependencies: There are no attributes that are partially or transitively dependent on the primary key, further ensuring compliance with BCNF.

### **Item Table**

**Functional Dependencies:**

* Item\_ID → Item\_Name, Item\_Price, Item\_Quantity

**Analysis for BCNF:**

* Singular Determinant - Item\_ID: As the only determinant, and also the primary key, Item\_ID's relationship with the other attributes is direct and unique. This single-attribute primary key scenario typically simplifies BCNF compliance.
* Direct Dependency: All attributes are directly dependent on Item\_ID, and there is no scope for partial or transitive dependencies, ensuring adherence to BCNF.

### 

### 

### **Store Table**

**Functional Dependencies:**

* Branch\_ID → Branch\_Name, Branch\_Location, Branch\_Stock

**Analysis for BCNF:**

* Branch\_ID as Superkey: Branch\_ID, being the primary key, is a superkey. All other attributes are fully functionally dependent on Branch\_ID.
* Absence of Non-Primary Determinants: There are no other determinants in the table, which simplifies the BCNF analysis and ensures compliance.

### **Billing Table**

**Functional Dependencies:**

* Transaction\_ID → Taxes, Total\_Amount, Discounts, Payment\_Method, Status, Returns, Transaction\_Date

**Analysis for BCNF:**

* Unique Identifier - Transaction\_ID: The primary key Transaction\_ID is the only determinant. All attributes in the table are fully dependent on it.
* BCNF Compliance: Since there are no other candidate keys or complex dependencies, the table easily meets the criteria for BCNF.

### **Employee Table**

**Functional Dependencies:**

* E\_ID → F\_Name, L\_Name, Address, Email, E\_Hours, P\_Number, E\_Wage, Banking\_Info
* Email → E\_ID (assuming Email is unique per employee)

**Analysis for BCNF:**

* E\_ID as Primary Key: E\_ID is a superkey and satisfies the BCNF condition by being the unique identifier for all other attributes.
* Email and E\_ID Relationship: Since Email uniquely identifies an employee, it could be considered a candidate key. The mutual dependency between Email and E\_ID doesn't violate BCNF as they are both candidate keys.

**Conclusion:** Each table adheres to the requirements of BCNF. They exhibit clear, direct functional dependencies where the determinants are superkeys (usually primary keys), ensuring uniqueness and minimizing redundancy. This analysis demonstrates well-designed table structures that support efficient data management and integrity. The absence of transitive or partial dependencies in these tables is indicative of a well-normalized database design.