**ASSIGNMENT 3 (NORMALIZATION)**

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**-Definitions of Normal Forms Considering Only Primary Keys:**

1. First Normal Form (1NF):

- A relation is in 1NF if all the attributes contain only atomic (indivisible) values. In other words, each attribute must contain a single value, and each record must be unique.

2. Second Normal Form (2NF):

- A relation is in 2NF if it is in 1NF and every non-primary key attribute is fully functionally dependent on the primary key. This means there are no partial dependencies of any non-primary key attribute on a part of the primary key. (This is relevant only if the primary key is composite; otherwise, it’s automatically in 2NF if in 1NF.)

3. Third Normal Form (3NF):

- A relation is in 3NF if it is in 2NF and all the non-primary key attributes are not only fully functionally dependent on the primary key but also non-transitively dependent. In other words, no non-primary key attribute depends on another non-primary key attribute.

**-General Definitions of 2NF and 3NF Considering All Keys:**

When considering all keys (both primary and candidate keys), the definitions are as follows:

1. First Normal Form (1NF):

- Same as above, a relation is in 1NF if all attributes contain only atomic values and each record is unique.

2. Second Normal Form (2NF):

- A relation is in 2NF if it is in 1NF and every non-key attribute is fully functionally dependent on every candidate key. This means there are no partial dependencies of any non-key attribute on any part of any candidate key.

3. Third Normal Form (3NF):

- A relation is in 3NF if it is in 2NF and every non-key attribute is non-transitively dependent on every candidate key. This means that no non-key attribute is dependent on another non-key attribute, considering all candidate keys.

**-Differences Between Definitions:**

Scope of Functional Dependencies:

Primary Key Only: 2NF and 3NF definitions considering only primary keys focus on functional dependencies involving the primary key only.

All Candidate Keys: General definitions of 2NF and 3NF take into account all candidate keys (including primary keys). This means that partial and transitive dependencies involving any candidate key need to be considered.

Partial Dependencies:

Primary Key Only: In 2NF, partial dependencies are removed only with respect to the primary key.

All Candidate Keys: In 2NF, partial dependencies are removed with respect to all candidate keys.

Transitive Dependencies:

Primary Key Only: In 3NF, transitive dependencies are considered only with respect to the primary key.

All Candidate Keys: In 3NF, transitive dependencies must be removed with respect to all candidate keys.