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Assignment_Normalization1
CS457(A) - Data Modeling and Implementation Techniques

1. Normalization is the process of partitioning large tables into small ones, and establishment of relationships between database tables and separating redundancy is the process of the denormalization process.

2. A table is in 1NF (First Normal Form) when it meets the following criteria:A table is in 1NF (first normal form) in such cases when it obeys two basic rules:

   ● Moreover, it has a primary key.
   ● This structure lets each column contain the elements which then create individual sets (a set of values, a list), and finally each cell within every column is only a single value.
   ● Each column stands for an item you will find often in words such as a letter, syllable or word.
   ● Sequence does not make any difference as long as it is not rows prior to columns.

3. A table may be written in 2NF (Second Normal Form) when it is already in 1NF (first normal form). the list should contain the information that is not a prime attribute and is set as a fully functional dependency based on the primary key.

4. A table is in 3NF when it is in 2NF and it is free from any dependency on any other tables. The table is now atomic, meaning it must contain a primary key and relate to another table. Consequently, there is no object for which are others that have dependency columns other than the key to primary.

5. If we look at the table in the form of BCNF (Boyce-Codd Normal Form), we will see that the table lies in 3NF. Regardless of loss, candidate key is non-loss determinant. Therefore, the table needs to be in a higher form of normalization. It shows that the candidate key is just a combination of two or more attributes that not only has distinct value for each row but also no other rows contain the same pair.

6. Answer:
   a. C1 and C3 are primary key as seen from the table
      From the diagram, we can see C1 and C2 have partial dependency. C2 only depends on C1 (primary key).

From the diagram, we can see that C4 defines C5 i.e. C5 depends on C4 which means they have transitive dependency since C4 is not a part of primary keys.

This points out the C1, C3 → C2, C4, C5 functional dependency, which is valid because all other keys may only exist in the case that the primary key made of C1 and C3 does.
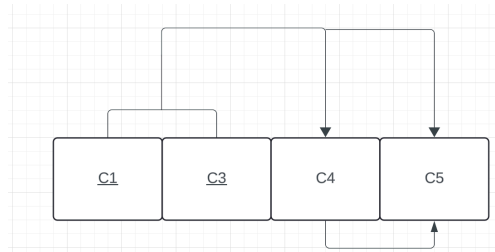
b.

Table 1:
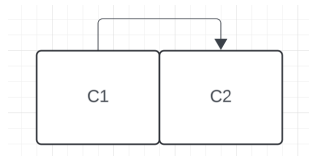
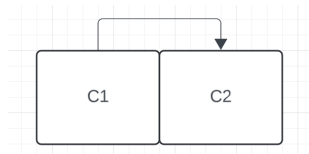Here, C1 is the primary key
There is no foreign key.

Table 2:

Here, C1 and C3 are the sets of primary keys and C1 references to table 1 so it becomes foreign key.

There exists Second Normal form (2NF) as there exists transitive dependencies.
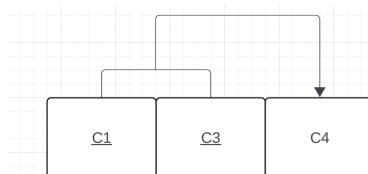
c. Table 1:

Here, C1 is the primary key
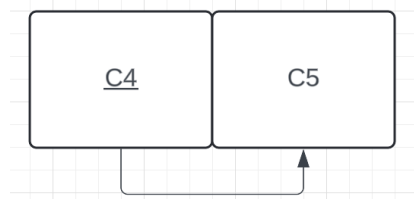There is no foreign key.

Table 2:

Here, C1 and C3 are the sets of primary keys and C1 references to table 1 so it becomes foreign key.

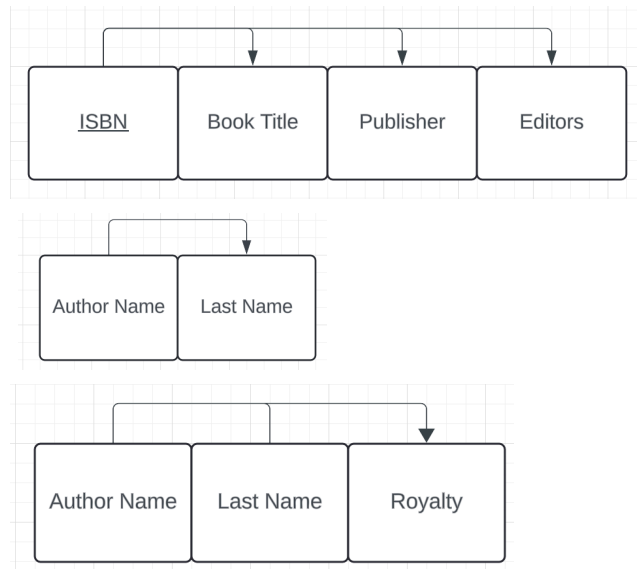There exists Third Normal form (3NF).

Table 3:


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┌──────────┬──────────┐
│    C4    │    C5    │
└──────────┴──────────┘
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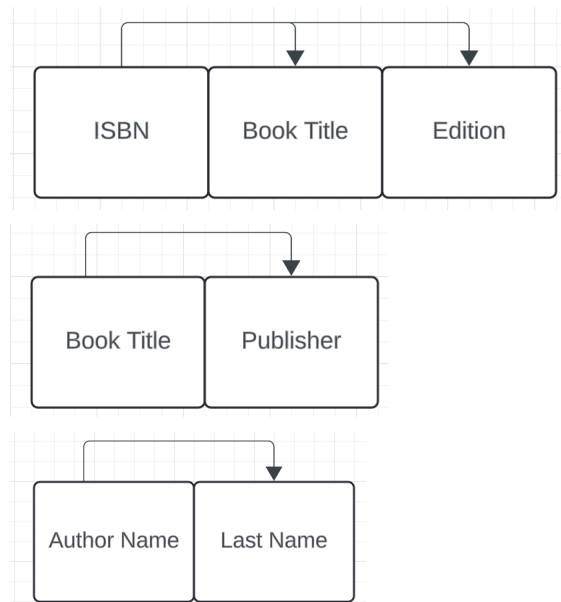
Here, C4 defines C5. C4 becomes the primary key for table 3. But it acts as foreign key in table 2. There exists Third Normal form (3NF).

7. Answer:

   a.


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┌────────┬────────────┬────────────┬──────────┐
│  ISBN  │ Book Title │ Publisher  │ Editors  │
└────────┴────────────┴────────────┴──────────┘
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┌──────────────┬────────────┐
│ Author Name  │ Last Name  │
└──────────────┴────────────┘
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┌──────────────┬────────────┬──────────┐
│ Author Name  │ Last Name  │ Royalty  │
└──────────────┴────────────┴──────────┘
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   b.


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┌──────────┬────────────┬──────────┐
│   ISBN   │ Book Title │ Edition  │
└──────────┴────────────┴──────────┘
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┌────────────┬────────────┐
│ Book Title │ Publisher  │
└────────────┴────────────┘
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┌──────────────┬────────────┐
│ Author Name  │ Last Name  │
└──────────────┴────────────┘
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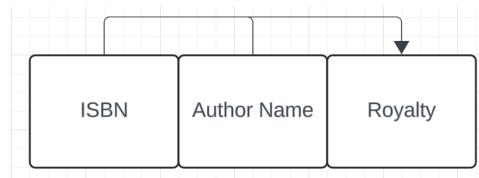
ISBN	Author Name	Royalty

8. A partial dependency is when a non-primary attribute is only dependent on some portion of the primary key but not the entire primary key. SNF means its Second Normal Form (2NF).

9. The three data anomalies likely to result from data redundancy are:
   a. Update Anomalies: When incorrect data is updated in one place not another that causes conflicts with data in both places.

   b. Insertion Anomalies: Whenever inability to add some data is attributed to a lack of other related data.

   c. Deletion Anomalies: When an accidental deletion of the data results in losing other data not intended to be deleted.

   These issues in the tables can be resolved through normalization, which accepts tables as composed of smaller, well-structured tables and sets up relations between them.

10. Transitive dependency takes place when one of the attributes that must be a prime does not depend directly on a primary key but on another non-prime attribute. For instance, a table whose A depends upon B, and B, in turn, depends upon C is not in the Third Normal Form (3NF) because B acts as a mediator for A and C.

11. The table whose main key consists of one attribute is already in 2NF under 1NF because at 1NF stage, instances of partial dependency are not possible over 1NF. Considering the fact that the PK carries only one attribute, it's impossible to have partial dependency.

12. The relationship between two attributes where one attribute is dependent on another attribute when the dependent attribute, whatsoever is not the primary key, is known as transitive dependency. It is a scenario where the secondary attribute does not have functional dependency on the primary key but on another non-key attribute. Data redundancy can be caused by transitive dependencies and this is removed by applying 3NF Normals Form (3NF) at least.