

PAST QUESTION 2022/2023

- I. Full dependency occurs when one attribute is functionally dependent on a composite (multiple) key and not just a part of that key
- II. Multi-valued occur when two alternative attributes in a table are independent of each other but both depend on a third attribute
- III. Transitive dependency occur dependency occurs when one non-prime attribute is dependent on another non-prime attribute
- IV. Non-loss decomposition: also known as Lossless decomposition is a process in which a relation is decomposed into two or more relations without losing any information.
- V. Functional dependency is a relationship between pairs of attributes in a relation
- VI. Relational algebra:

1B

Database and Databank

A databank is a collection of data that is organized and stored in a specific way. It can be a physical location where data is stored, or a virtual location where data is stored electronically while A database is a structured collection of data that is stored and accessed electronically.

DML VS DDL

DML means Data Manipulation Language is used to manipulate data itself. For example: insert, update, and delete are instructions in SQL (e.g. Update delete, and insert) while DDL means Data Definition Language that is used to define data structures (E.g creating and altering tables).

Logical data and Physical data

A logical data model is a data model that provides a detailed, structured description of data elements and the connections between them. It includes all entities, and relationships among the. These entities have defined their attributes as their characteristics While A physical data model specifies how the data model will be built in the database. It outlines all table structures, including column name, data types, column constraints, primary key and foreign key

External Schema and Conceptual schema

The conceptual view, also known as the conceptual schema, represents the entire database from a neutral and high-level perspective. It focuses on describing data types, entities, relationships, etc.

An external view, also known as an external schema, describes the part of the database in which a specific user is interested. It hides the unrelated details of the database from the user.

2A

Normalization is the process of structuring a relational database to reduce data redundancy and improve data quality and integrity.

2Ai

Reduced data redundancy: Normalization helps to eliminate duplicate data in tables, reducing the amount of storage space needed and improving database efficiency.

Improved data consistency: Normalization ensures that data is stored in a consistent and organized manner, reducing the risk of data inconsistencies and errors.

Easier database maintenance: Normalization reduces the complexity of a database by breaking it down into smaller and making it easier to add, modify, and delete data.

Data Integrity: Normalization helps to maintain data integrity by minimizing anomalies such as insertion, update, and deletion anomalies.

2B

To establish the normal form of a relation in a database. Requires normal form

First Normal Form (1NF)

Second Normal Form (2NF)

Third Normal Form (3NF)

Boyce Codd Normal Form (BCNF)

Fourth Normal Form (4NF)

Fifth Normal Form (5NF)

2C

The relation should be analysed to identify the attributes (columns) and the dependencies between them then followed by the normal forms to measure the degree of perfection.

Analyze the relation

Normalize the Relation

Data Cleaning and Refinement

Consult shareholders (such as Database administrators, developers, and end-users) for their input into the normalization process

2D

Determinant: A determinant in a database table is any attribute that you can use to determine the values assigned to other attributes in the same row. Example: $X \rightarrow Y$. X is the determinant

Cardinality: cardinality is the numerical relationship between rows of one table and rows in another. We have four types of cardinality one-to-one, one-to-many, many-to-one, and many-to-many

Degree: is the number of attributes within a relation. Example: let's say we have three attributes Matric No, "Name," and "Age then our degree of relation is 3

3D

Attributes:

D (Day of the week)

P (Period within the day)

C (Classroom number)

T (Teacher's name)

S (Student's name)

L (Lesson identifier)

$(D, P) \rightarrow (C, T, S, L)$: Day and Period combination assigned to a unique classroom, teacher, student, and lesson)

With the analysis, we can proceed to perform normalization to reduce data redundancy and improve data integrity

First Normal Form: The data is already in First normal form as all attributes are atomic.

Second normal form: There is no partial dependency as the primary key is (D, P)

Third Normal Form (3NF): It is not in the third normal form as there is a transitive dependency between (D, P) and (C, T, S, L).

To remove this transitive dependency, we can decompose the relation into two relations:

Relation 1

(TBL1):

$(D, P) \rightarrow (C)$

Relation 2

(TBL2):

$(D, P) \rightarrow (T, S, L)$

Now each relation now functionally dependent on its primary key, So we now have two tables

Resulting Relations:

TBL1: (D, P, C)

TBL2: (D, P, T, S, L)

By decomposing, we have achieved the third normal form, reduced redundancy and enhanced data integrity.

4A

False.

True.

False

True

4B

True

True

False

True

You guys should not be vexed... The question choked and wasn't able to finish it
GOOD LUCK