# Database Management Systems (CSN-351)
# Relational Database Design (QA)

**BTech 3rd Year (CS) + Minor + Audit**

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# Question 1

Relation $R$ has eight attributes $ABCDEFGH$. Fields of $R$ contain only atomic values. $F = \{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$ is a set of functional dependencies (FDs) that hold for $R$. How many candidate keys does the relation $R$ have?

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Consider the FDs given in above question. The relation $R$ is

- in 1NF, but not in 2NF.
- in 2NF, but not in 3NF.
- in 3NF, but not in BCNF.
- in BCNF.

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# Question 2

Which of the following is TRUE?

- Every relation in 3NF is also in BCNF.
- A relation $R$ is in 3NF if every non-prime attribute of $R$ is fully functionally dependent on every key of $R$.
- Every relation in BCNF is also in 3NF.
- No relation can be in both BCNF and 3NF.

# Question 2

Which of the following is TRUE?

- Every relation in 3NF is also in BCNF.
- A relation $R$ is in 3NF if every non-prime attribute of $R$ is fully functionally dependent on every key of $R$.
- **Every relation in BCNF is also in 3NF.**
- No relation can be in both BCNF and 3NF.

# Question 3

Consider the following relational schema:

$Suppliers(\underline{sid : integer}, sname : string, city : string, street : string)$
$Parts(\underline{pid : integer}, pname : string, color : string)$
$Catalog(\underline{sid : integer}, \underline{pid : integer}, cost : real)$

Assume that, in the suppliers relation above, each supplier and each street within a city has a unique name, and $(sname, city)$ forms a candidate key. No other functional dependencies are implied other than those implied by primary and candidate keys. Which one of the following is TRUE about the above schema?

- The schema is in BCNF.
- The schema is in 3NF but not in BCNF.
- The schema is in 2NF but not in 3NF.
- The schema is not in 2NF.

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- The schema is in 2NF but not in 3NF.
- The schema is not in 2NF.

# Question 4

Consider the following relational schemas for a library database:

$Book(Title, Author, Catalog\_no, Publisher, Year, Price)$
$Collection(Title, Author, Catalog\_no)$

with the following functional dependencies:

I. $TitleAuthor \rightarrow Catalog\_no$
II. $Catalog\_no \rightarrow TitleAuthorPublisherYear$
III. $PublisherTitleYear \rightarrow Price$

Assume $Author, Title$ is the key for both schemas. Which of the following statements is true?

- Both Book and Collection are in BCNF.
- Both Book and Collection are in 3NF only.
- Book is in 2NF and Collection is in 3NF.
- Both Book and Collection are in 2NF only.

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# Question 5

Every table with two single-valued attributes is in 1NF, 2NF, 3NF and BCNF.

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ANSWER: **true**

# Question 6

The maximum number of superkeys for the relation schema $R(E, F, G, H)$ with $E$ as the key is _____ .

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ANSWER: **8**

# Question 7

Consider a relation schema $R = (A, B, C, D, E, H)$ on which the following functional dependencies hold: $\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$. What are the candidate keys of $R$?

# Question 7

Consider a relation schema $R = (A, B, C, D, E, H)$ on which the following functional dependencies hold: $\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$. What are the candidate keys of $R$?

ANSWER: $AEH, BEH, DEH$

# Question 8

The relation schema $Student\_Performance(name, courseNo, rollNo, grade)$ has the following functional dependencies:

$name, courseNo \rightarrow grade$
$rollNo, courseNo \rightarrow grade$
$name \rightarrow rollNo$
$rollNo \rightarrow name$

The highest normal form of this relation schema is _____ .

# Question 8

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$name, courseNo \rightarrow grade$
$rollNo, courseNo \rightarrow grade$
$name \rightarrow rollNo$
$rollNo \rightarrow name$

The highest normal form of this relation schema is _____ .

ANSWER: **3NF**

# Question 9

Consider the following functional dependencies in a database:

$Date\_of\_Birth \rightarrow Age$
$Age \rightarrow Eligibility$
$Name \rightarrow Roll\_number$
$Roll\_number \rightarrow Name$
$Course\_number \rightarrow Course\_name$
$Course\_number \rightarrow Instructor$
$(Roll\_number, Course\_number) \rightarrow Grade$

The relation $(Roll\_number, Name, Date\_of\_birth, Age)$ is:

- In second normal form but not in third normal form.
- In third normal form but not in BCNF.
- In BCNF.
- None of the above.

# Question 9

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$Roll\_number \rightarrow Name$
$Course\_number \rightarrow Course\_name$
$Course\_number \rightarrow Instructor$
$(Roll\_number, Course\_number) \rightarrow Grade$

The relation $(Roll\_number, Name, Date\_of\_birth, Age)$ is:

- In second normal form but not in third normal form.
- In third normal form but not in BCNF.
- In BCNF.
- **None of the above.**

# Question 10

From the following instance of a relation scheme $R(A, B, C)$, we can conclude that:

| $A$ | $B$ | $C$ |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 1 | 0 |
| 2 | 3 | 2 |
| 2 | 3 | 2 |

- $A$ functionally determines $B$ and $B$ functionally determines $C$.
- $A$ functionally determines $B$ and $B$ does not functionally determine $C$.
- $B$ does not functionally determine $C$.
- $A$ does not functionally determine $B$ and $B$ does not functionally determine $C$.

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- $A$ functionally determines $B$ and $B$ does not functionally determine $C$.
- **$B$ does not functionally determine $C$.**
- $A$ does not functionally determine $B$ and $B$ does not functionally determine $C$.

# Question 11

Given the following relation instance.

| $X$ | $Y$ | $Z$ |
|---|---|---|
| 1 | 4 | 2 |
| 1 | 5 | 3 |
| 1 | 6 | 3 |
| 3 | 2 | 2 |

Which of the following functional dependencies are satisfied by the instance?

- $XY \rightarrow Z$ and $Z \rightarrow Y$
- $YZ \rightarrow X$ and $Y \rightarrow Z$
- $YZ \rightarrow X$ and $X \rightarrow Z$
- $XZ \rightarrow Y$ and $Y \rightarrow X$

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- **$YZ \rightarrow X$ and $Y \rightarrow Z$**
- $YZ \rightarrow X$ and $X \rightarrow Z$
- $XZ \rightarrow Y$ and $Y \rightarrow X$

# Question 12

A table has fields $F1, F2, F3, F4, F5$ with the following functional dependencies $F1 \rightarrow F3, F2 \rightarrow F4, (F1.F2) \rightarrow F5$. In terms of Normalization, this table is in _____ .

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ANSWER: **1NF**

# Question 13

Let $R(A, B, C, D, E, F, G)$ be a relational schema in which the following functional dependencies are known to hold: $AB \rightarrow CD, DE \rightarrow F, C \rightarrow E, F \rightarrow C$ and $B \rightarrow G$. The relational schema $R$ is in _____ .

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ANSWER: **1NF**