Branch : CSE & IT Batch : English

Database Management System

FD's & Normalization

DPP 07

[MCQ]

1. Consider the following two relational schemas
Schema 1: R (P, Q, R, S)
Schema 2: R_1(P, Q, R) R_2(Q, S) and the following statements.

S_1: If the only functional dependencies that hold on the relation in the schema 1 are P → Q, R → S, then relation R is in BCNF.

S_2: If the only FD that hold on the relation in the schema 2 are P→Q, P→R, Q→P, P→S then the relation R_1 and R_2 are in BCNF.

Which of the following statements are true?

(a) Only S_1 is true
(b) Only S_2 is true.
(c) Both S_1 & S_2 are true
(d) Neither S_1 nor S_2 are true

[MCQ]

2. Assume that a relation is in 3NF under which of the following conditions R can violate BCNF?

(a) The table consists two candidate keys that share a common attribute.
(b) The table consists of two non-overlapping candidate keys.
(c) The table has a unique candidate key consisting of one attribute.
(d) The table consists of two candidate keys each consisting of one attribute.

[MCQ]

3. Consider a relation R(P, Q, R, S, T, U, V, W) with the following functional dependencies:
{RW→V, P→QR, Q→RUW, T→P, U→TV}, then the relation R is in _____.

(a) 1NF (b) 2NF
(c) 3NF (d) BCNF

[MCQ]

4. Consider the following statements

S_1: If the proper subset of candidate key determines non-prime attribute, then it is known as partial dependency.

S_2: If P→Q and Q→R are two FD's then P→Q is known as transitive dependency

Which of the statements are/is true?

(a) Only S_1 (b) Only S_2
(c) Both S_1 and S_2 (c) Neither S_1 nor S_2

[MCQ]

5. Consider the following statements about Boyce – Codd Normal Form (BCNF)

S_1: The determinant for each functional dependency must be a super key.

S_2: Transitive dependencies does not result in abnormalities in a relation in BCNF.

(a) Only S_1 is true
(b) Only S_2 is true
(c) Both S_1 and S_2 are true
(d) Neither S_1 nor S_2 is true

[MCQ]

6. Consider a table/Relation R has one candidate key, then which of the following is always true?

(a) If R is in 2NF, then it is also in 3NF
(b) If R is in 3NF, then it is also in BCNF
(c) If R is in 2NF, but it is not in 3NF
(d) None of the above.

[MSQ]

7. Let's suppose, dependencies have to be preserved and BCNF decomposition is not possible. Which of the following normal forms can be still achievable (while preserving dependencies)?

(a) 1NF (b) 2NF
(c) 3NF (d) 4NF

[MCQ]

8. Consider a relation R(P, Q, R, S, T) with the set of FD's {PQR$\rightarrow$ ST and T $\rightarrow$ QRS} which of the following statements is true?

(a) R is not in 2NF
(b) R is in 2NF but not in 3NF
(c) R is in 3NF but not in BCNF
(d) R is in BCNF

Answer Key

1. **(b)**
2. **(a)**
3. **(a)**
4. **(a)**
5. **(c)**
6. **(b)**
7. **(a, b, c)**
8. **(a)**

Hints & Solutions

1. (b)

S_1(False):

The candidate key of schema 1 is PR, therefore both FD violates the BCNF property, so schema 1 is not in BCNF.

S_2(True):

The candidate key of R_1 is P, Q and R_2 is Q in schema2, therefore, relation R_1 & R_2 are in BCNF

2. (a)

Let us take an relation R(P, Q, R, S) with FD Set = P{P→QR, QR→PS, S→Q}. The table has two candidate keys that share a common attributes QR and RS. Therefore, relation is in 3NF, but not in BCNF, as FD S→Q violates BCNF. Hence it is in 3NF but not in BCNF.

3. (a)

RW→V

P→Q

P→R

Q→R

Q→U

Q→W

T→P

U→T

U→V

As we can see in the 3rd FD P→R, P is prime attribute and Q is non-prime attribute, therefore this relation does not satisfy 2NF and higher normal form. So, the highest normal form satisfied by the above relation is 1NF.

4. (a)

P→Q and Q→R are two FD's then P→R is known as transitive dependency, hence S_2 is false.

S_1(True):

A determinant must be either a candidate key or a super key for each functional dependency.

S_2(True):

In 3NF we remove transitive dependency, and every BCNF is in 3NF.

6. (b)

If there is only one candidate key and relation is 3NF, that means all functional dependency determinants is Candidate key thus relation is in BCNF, Hence, option (b) is true.

7. (a, b, c)

1NF, 2NF and 3NF are always achievable even while there is a need of preserving dependencies. Since 4NF implies BCNF, 4NF is not achievable in this case.

8. (a)

PQR→ST

T→QRS

$(PQR)^+$ = {P, Q, R, S, T}

$(PT)^+$ = {P, Q, R, S, T}

Candidate key = {PQR, PT}

PQR→ST

PQR is candidate key therefore PQR→ST

Satisfy BCNF

T→QRS

T is not a super key and QRS is not prime. Also, T→ S is a partial dependency as the proper subset of candidate key determine non-prime attributes therefore it violates 2NF, hence answer is (a)