Experiment 1.4

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FUNCTIONAL DEPENDENCIES

1. **Consider a relation R having attributes as R(ABCD), functional dependencies are given below:**

   AB->C, C->D, D->A

   Identify the set of candidate keys possible in relation R. List all the set of prime and non prime attributes.

Sol:

By using the short trick, B is missing on the right-side of given functional dependencies , so it is sure that it will be the part of our candidate key.

Closures-

B^+ - B (Not determines all the attributes so use it by combining with other attributes)
BA^+ - BACD
BC^+ - BCDA
BD^+ - BDAC

Candidate keys:- (BA, BC, BD)

Prime attributes are:- A, B, C, D

Non-prime attributes are:– N/A

NORMAL FORM: 3NF (as the determinant is a super key or the dependent value is a prime attribute)

2. **Consider a relation R(ABCDE) having functional dependencies as:**

   A->D, B->A, BC->D, AC->BE

   Identify the set of candidate keys possible in relation R. List all the set of prime and non-prime attributes.

Sol:

C is missing on right-side of the given functional dependencies, so it will be our candidate key or a part of it.

Closures:-

C^+ - C

AC^+ - ACBED

BC^+ - DBCAE

DC^+ - DC

Candidate keys:- (AC, BC)

Prime Attributes are:- A, B, C

Non-prime Attributes are:- D, E

NORMAL FORM: 1NF (as all the attribute are arranged atomically in the database)

3. **Consider a relation R having attributes as R(ABCDE), functional dependencies are given below:**

   B->A, A->C, BC->D, AC->BE

   Identify the set of candidate keys possible in relation R. List all the set of prime and non prime attributes.

Sol:

Here all the attributes are present on the right side so take all the attributes one by one.

Closures:-

A^+ – ACBED

B^+ - BACDE

C^+ - C
D^+ - D

Candidate keys:- (A, B)

Prime attributes are:- A, B

Non-prime attributes are:- C, D

NORMAL FORM: BCNF (as all the determinants are super/candidate keys)

4. **Consider a relation R having attributes as R(ABCDEF), functional dependencies are given below:**

   A->BCD, BC->DE, B->D, D->A

   Identify the set of candidate keys possible in relation R. List all the set of prime and non prime attributes.

Sol:

F is missing on the right side of the given functional dependencies, so it sure that is the part of candidate key.

Closures:-

F^+ - F
AF^+ - AFBCDE
BF^+ - BFDACE
CF^+ - CF
DF^+ - DFABCE
EF^+ - EF

Candidate keys:- (AF, BF, DF)

Prime attributes are:- A, B, D, F

Non-prime attributes are:- C, E

NORMAL FORM: 1NF (as all the attributes are arranged atomically)

5. **Design a student database involves certain dependencies which are listed below:**

   X ->Y, **WZ ->X**, **WZ ->Y**, **Y ->W**, **Y ->X**, **Y ->Z**

The task here is to remove all the redundant FDs for efficient working of the student database management system.

Sol:

Here all the attributes are present on the right side so take all the attributes one by one.

Closures:-

X^+ - XYWZ

Y^+ – YXWZ

W^+ - W

Z^+ - Z

WZ^+ – YXWZ

Candidate keys:- (X, Y, WZ)

Prime attributes are:- X, Y, W, Z

NORMAL FORM: BCNF (as all the determinants are super/candidate keys)

6. **Debix Pvt Ltd needs to maintain database having dependent attributes ABCDEF. These attributes are functionally dependent on each other for which functionally dependency set F given as:**

{A -> BC, D -> E, BC -> D, A -> D}

Consider a universal relation R1(A, B, C, D, E, F) with functional dependency set F, also all attributes are simple and take atomic values only. Find the highest normal form along with the candidate keys with prime and non-prime attribute.

Sol:

A and F are missing so they will be considered as a part of the candidate key.

Closures:-

AF^+ - AFBCDE

B^+ - B

A^+ - ABCDE (F is still missing)

Candidate key is:- (AF)

Prime attributes are:- A, F

Non-prime attributes are:- B, C, D, E

NORMAL FORM: 1NF (as all the attributes are arranged atomically)