



Experiment - 4

Student Name: Amrit Dey

UID: 23BCS12543

Branch: BE-CSE

Section/Group: KRG_1A

Semester: 5th

Date of Performance: 8/9/25

Subject Name: Advanced Database and Management System **Subject**

Code: 23CSP-333

PROBLEMS ON 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.

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 so taking **Closures-**

B(+) - B (Not determines all the attributes so use it by combining with other attributes)

BA(+) - BACD

BC(+) - BCDA

BD(+) - BDAC

So the candidate keys are - (BA,BC,BD)

Prime attributes are - A,B,C,D

Non-prime attributes are - 0 So
the normal form will be 3NF .

**2. 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 so it will be our candidate key or a part of it. Closures- A^{+} - DA

C^{+} - C

AC^{+} - ACBED BC(+)

- DBCAE

DC^{+} - DC

So the candidate keys are - (AC,BC)

Prime Attributes are - A,B,C

Non-prime Attributes are - D,E The normal form will be 1NF.

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

$B \rightarrow A, A \rightarrow C, BC \rightarrow D, AC \rightarrow BE$

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

Sol.

Closures -

B^{+} - BACDE

A^{+} - ACBED

C^{+} - C

D^{+} - D

AC^{+} - ACBED

BC^{+} - BCDAE

So the candidate keys are (A,B)

The super keys are (AC,BC)

Prime attributes are - A,B

Non-prime attributes are - C,D,E

The normal form will be BCNF. (as AC and BC are super 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 given functional dependencies. So , it is sure to be our candidate key or a part of it.

Closures- F(+)

- F

AF(+) - AFBCDE

BF(+) - BFDACE CF(+)

- CF

DF(+) - DFABCE EF(+)

- EF

So the candidate keys are (AF,BF,DF)

Prime attributes are - A,B,D,F

Non-prime attributes are - C,E

The normal form will be 1NF.

5. Designing a student database involves certain dependencies which are listed below: X ->Y

WZ ->X

WZ ->Y

Y ->W

Y ->X

Y ->Z

Identify the set of candidate keys possible in student database. List all the set of prime and non prime attributes.

Sol.

Closures-

X(+) - XYWZ

$Y(+) - YXWZ$

$Z(+) - Z$

$WZ(+) - YXWZ$

So the candidate keys are (X,Y,WZ) Prime
attributes are X,Y,W,Z

Non-prime attributes are NOT ANY So
the normal form is BCNF.

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

$\{A \rightarrow BC, D \rightarrow E, BC \rightarrow D, A \rightarrow D\}$

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.

$AF(+) - AFBCDE$

$BF(+) - BF$

$B(+) - B$

$A(+) - ABCDE$ (F is still missing) So
candidate key is (AF) only.

Prime attributes are A,F.

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

So the highest possible normal form will be 1NF.