



# DEPARTMENT OF COMPUTER SCIENCE &

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## Experiment - 4

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### FUNCTIONAL DEPENDENCIES -

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

$AB \rightarrow C, C \rightarrow D, D \rightarrow A$

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

Candidate keys :- (BA,BC,BD) Prime

attributes are - A,B,C,D

Non-prime attributes are - 0

**NORMAL FORM: 3NF .**

**2. Relation R(ABCDE) having functional dependencies as :**

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

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

**Sol.**

C is missing on right-side 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**

**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 -

$B(+) - BACDE$

$A(+) - ACBED$

$C(+) - C$

$D(+) - D$

Candidate keys :- (A,B)

Prime attributes are - A,B

Non-prime attributes are – C,D,E

**NORMAL FORM: BCNF .**

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

$A \rightarrow BCD$ ,  $BC \rightarrow DE$ ,  $B \rightarrow D$ ,  $D \rightarrow A$

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

### Solution

Closures-

$F(+) - F$

$AF(+) - AFBCDE$

$BF(+) - BFDACE$

$CF(+) - CF$

$DF(+) - DFABCE$

$EF(+) - EF$

(AF,BF,DF) Prime attributes are -

A,B,D,F

Non-prime attributes are – C,E

**NORMAL FORM: 1 NF.**

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

$X \rightarrow Y$

$WZ \rightarrow X$

$WZ \rightarrow Y$

$Y \rightarrow W$

$Y \rightarrow X$

$Y \rightarrow Z$

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

**Sol.**

Closures-

$X(+) - XYWZ$

$Y(+) - YXWZ$

$Z(+) - Z$

$WZ(+) - YXWZ$

Candidate keys :-  $(X, Y, WZ)$

Prime attributes are  $X, Y, W, Z$

**NORMAL FORM: BCNF.**

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:

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

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

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 .**



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