



**University Institute of Engineering**  
**Department of Computer Science & Engineering**

**EXPERIMENT: 4**

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**BRANCH: BE-CSE**

**SECTION / GROUP: KRG\_2A**

**SEMESTER: 5<sup>TH</sup>**

**SUBJECT CODE: 23CSP-339**

**SUBJECT NAME: ADBMS**

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.

Ans:

R (A, B, C, D)

Closure:

$A^+ \rightarrow A$

$B^+ \rightarrow B$

$C^+ \rightarrow C, D, A$

$AB^+ \rightarrow A, B, C, D$

$AC^+ \rightarrow A, C, D$

$AD^+ \rightarrow A, D,$

$BC^+ \rightarrow B, C, D, A$

$BD^+ \rightarrow B, D, A, C$

$CD^+ \rightarrow C, D, A$

Candidate Keys: AB, BC, BD

Prime Attributes: A, B, C, D

Non-prime Attributes:

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.

Ans:

R (A, B, C, D, E)

Closure:

$A^+ \rightarrow A, D$

$B^+ \rightarrow B, A, D$

$C^+ \rightarrow C$

$AB^+ \rightarrow A, B, D$

$AC^+ \rightarrow A, C, D, B, E$

$AD^+ \rightarrow A, D$

$BC^+ \rightarrow B, C, A, D, E$

Candidate Keys: AC, BC

Prime Attributes: A, B, C

Non-prime Attributes: 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.

Ans:

R (A, B, C, D, E)

Closure:

$A^+ \rightarrow A, C, B, E, D$

$B^+ \rightarrow B, A, C, D, E$

$C^+ \rightarrow C$

$D^+ \rightarrow D$

$E^+ \rightarrow E$

Candidate Keys: A, B

Prime Attributes: A, B

Non-prime Attributes: 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.

Ans:

R (A, B, C, D, E, F)

Closure:

$A^+ \rightarrow A, B, C, D, E$

$B^+ \rightarrow B, D, A, C, E$

$C^+ \rightarrow C$

$D^+ \rightarrow D, A, B, C, E$

$E^+ \rightarrow E$

$F^+ \rightarrow F$

$AF^+ \rightarrow A, B, C, D, E, F$

$BF^+ \rightarrow B, F, D, A, C, E$

$CF^+ \rightarrow C, F$

$DF^+ \rightarrow D, F, A, B, C, E$

Candidate Keys: AF, BF, DF

Prime Attributes: A, B, D, F

Non-prime Attributes: C, E

Normal Form: 1NF

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

$X \rightarrow Y$

$WZ \rightarrow X$

$WZ \rightarrow Y$

$Y \rightarrow W$

$Y \rightarrow X$

$Y \rightarrow Z$

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

Ans:

R (W, X, Y, Z)

Closure:

$X^+ \rightarrow X, Y, W, Z$

$Y^+ \rightarrow Y, X, W, Z$

$WZ^+ \rightarrow W, Z, X, Y$

Candidate Keys: X, Y, WZ

Prime Attributes: X, Y, W, Z

Non-prime Attributes:

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.

Ans:

$R(A, B, C, D, E, F)$

Closure:

$A^+ \rightarrow A, B, C, D, E$

$B^+ \rightarrow B$

$C^+ \rightarrow C$

$D^+ \rightarrow D, E$

$AF^+ \rightarrow A, B, C, D, E, F$

Candidate Keys: AF

Prime Attributes: A, F

Non-prime Attributes: B, C, D, E

Normal Form: 1NF