



Experiment- 04

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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.

Ans:

R (A, B, C, D) Closure:

A+ □ A

B+ □ B

C+ □ C, D, A

AB+ □ A, B, C, D

AC+ □ A, C, D

AD+ □ A, D,

BC+ □ B, C, D, A BD+ □

B, D, A, C

CD+ □ 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→D

B→A

BC→D

AC→BE

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

Ans:

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

A⁺ ⊆ A, D

B⁺ ⊆ B, A, D

C⁺ ⊆ C

AB⁺ ⊆ A, B, D

AC⁺ ⊆ A, C, D, B, E

AD⁺ ⊆ A, D

BC⁺ ⊆ 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→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.

Ans:

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

A⁺ ⊆ A, C, B, E, D B⁺ ⊆

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:

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

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

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

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 $R_1(A, B, C, D, E, F)$ 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:

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



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AF+ A, B, C, D, E, F

Candidate Keys: AF

Prime Attributes: A, F

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

Normal Form: 1NF