Experiment 4

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Subject Name: Advanced Database   **Subject Code: 23CSP-333**
and Management System

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 prime attributes and
   nonprime attributes.
   Ans:

   R (A, B, C, D) Closure:
   $A+ \rightarrow A$
   $B+ \rightarrow B$
   $C+ \rightarrow C, D, A$
   $AB+ \rightarrow A, B, C, D$
   $AC+ \rightarrow A, C, D$
   $AD+ \rightarrow A, D$
   $BC+ \rightarrow B, D, A, C$
   $CD+ \rightarrow C, D, A$

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

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

Ans:

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

   A+ → A, C, B, E, D

   B+ → B, A, C, D, E

   C+ → C

   D+ → D

   E+ → 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 -> BCD
BC -> DE
B -> D
D -> A

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

Ans:

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

A+ → A, B, C, D, E
B+ → B, D, A, C, E
C+ → C
D+ → D, A, B, C, E
E+ → E
F+ → E
AF+ → A, B, C, D, E, F
BF+ → B, F, D, A, C, E
CF+ → C, F
DF+ → 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 -> Y
WZ -> X
WX -> Y
Y -> W
Y -> X
Y -> Z

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

Ans:

R (W, X, Y, Z) Closure:

X+ → X, Y, W, Z
Y+ → Y, X, W, Z
WZ+ → W, Z, X, Y

Candidate keys: X, Y, WZ Prime
Attributes: X, Y, Z, W Non-
Prime Attributes:
Normal Form: BCNF

6. Debix Pvt. Limited 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 R(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 candidate keys with prime and non-prime attributes.
Ans:
  R (A, B, C, D, E, F) Closure:
  A+ → A, B, C, D, E
  B+ → B
  C+ → C
  D+ → D, E
  AF+ → A, B, C, D, E, F

Candidate keys: AF
Prime Attributes: A, F
Non-Prime Attributes: B, C, D, E
Normal Form: 1NF