Experiment- 04

Student Name: Sukhmandeep Singh
UID: 23BCS13741
Branch: BE- CSE
Section/Group: Kargil 2- A
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Subject Name: ADBMS
Subject Code: 23CSP-333

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+ □ C

D+ □ D

E+ □ E

Candiate 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 the set of prime and non-prime 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

Candiate 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 WZ ->Y

   Y ->W

   Y ->X

   Y ->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+ □ X, Y, W, Z

   Y+ □ Y, X, W, Z

   WZ+ □ W, Z, X, Y

   Candiate 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 -> BC

   D -> E

   BC -> D

   A -> 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+ □ A, B, C, D, E

B+ □ B

C+ □ C

D+ □ D, E

AF+ □ A, B, C, D, E, F

Candiate Keys: AF

Prime Attributes: A, F

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

Normal Form: 1NF