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EXPERIMENT:4

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1. AIM:-

Solve the Problem related to Normalistion and give it closure ,candidate key along with prime attribute and non-prime attribute and in which type of normal exist

Problem 1

Consider a relation R having attributes as R(ABCD), functional dependencies are given below:
AB->C,
C->D,
D->A

Identifythe set ofcandidatekeyspossiblein relation R.Listalltheset ofprime andnonprime attributes.

Solution

Closures to find candidate keys

(AB)+

- Start: {A, B}
- From AB→C ⇒ {A, B, C}
- From C→D ⇒ {A, B, C, D}
- From D→A already there.

AB+ = {A, B, C, D}⇆ AB is a candidate key.

(BC)+

- Start: {B,C}
- From C→D⇆ {B, C, D}
- From D→A⇆ {A, B, C, D}

BC+ = {A, B, C, D}⇆ BC is a candidate key

(BD)+

- Start: {B, D}
- From D→A ⇒ {A, B, D}
  From AB→C ⇒{A, B, C, D}
  BD+ = {A, B, C, D} ⇒ BD is a candidate key
-

(CD)+

- Start: {C,D}
- From C→D ⇒ {C, D} (no change)
- From D→A ⇒ {A, C, D}
- From AB→C (needs B, but not present) → stop.
  CD is not a key.

Candidate Keys = {AB, BC, BD}

Prime and Non-prime Attributes

- Primeattributes= appear inat least one candidate key.
  - Candidate keys: {AB}, {BC}, {BD}
  - Prime attributes = {A, B, C, D} (since all appear across candidate keys).
- Non-prime attributes = none (all are prime).

Given Relation is in 3rd normal Form

Problem 2 Relation R(ABCDE) having functional dependencies as : A->D, B->A,

BC->D,
AC->BE
IdentifythesetofcandidatekeyspossibleinrelationR.Listall the set of prime and non prime attributes.

Solution

Step 1: closures to find candidate keys

(B, C)+

- Start: {B,C}
- From B→A ⇒ {A, B, C}
- From A→D ⇒ {A, B, C, D}
- From AC→BE (since A and C present) ⇒ {A, B, C, D, E}
  BC is a candidate key.

(A, C)+

- Start: {A, C}
- From A→D ⇒ {A, C, D}
- From AC→BE ⇒ {A, B, C, D, E}
  AC is a candidate key.

(B, E)+

- Start: {B, E}
- From B→A ⇒ {A, B, E}
- From A→D ⇒ {A, B, D, E}
- From AC→BE (need C)
- From BC→D (need C)
  So {B, E, A, D} (missing C) not a key.

(B, C, E)+

- Start: {B, C, E}
- B→A ⇒ {A, B, C, E}
- A→D ⇒ {A, B, C, D, E} .
- But BC alone is already a key → So BCE is superkey, not minimal.

So, Candidate Keys = {BC, AC}

- Prime attributes = those that appear in at least one candidate key.
  - Candidate keys = {BC, AC}
  - Prime attributes = {A, B, C}.
- Non-prime attributes = the rest.
  - Non-prime = {D, E}.

Normal Form
GivenRelationis in 1Normal Form

Problem 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.
Solution
Compute Closures

(B, C)+

- Start: {B, C} From B → A ⇒ {A,
- B, C} From A → C (C already
- present) From AC → BE ⇒ {A,
- B, C, E} From BC → D ⇒ {A,
- B, C, D, E}.

BC is a candidatekey.

(A, C)+

- Start: {A, C}
- From A → C (no change)
- From AC → BE ⇒ {A, B, C, E}
- From B → A (already have A)
- From BC → D ⇒ {A, B, C, D, E}.

AC is a candidatekey.

(B, A)+ (sameasAB)

- Start: {A, B}
- From B → A (already there)
- From A → C ⇒ {A, B, C}
- From AC → BE ⇒ {A, B, C, E}
- From BC → D ⇒ {A, B, C, D, E}

AB is a candidate key.

(B)+

• • • Start: {B}
• From B → A ⇒ {A, B}
• From A → C ⇒ {A, B, C}
From AC → BE ⇒ {A, B, C, E}
From BC → D ⇒ {A, B, C, D, E}

B aloneisacandidatekey.

(A)+

• • • Start: {A}
• From A → C ⇒ {A, C}
• From AC → BE ⇒ {A, B, C, E}
From B → A (already have A)
From BC → D ⇒ {A, B, C, D, E}

A aloneisacandidatekey.

Minimal candidate keys = {A, B}

Prime vs Non-prime Attributes

- Primeattributes= attributes in any candidate key.
  - Candidate keys = {A, B}
  - Prime attributes = {A, B}
- Non-prime attributes = others.
  - Non-prime = {C, D, E}

Normal Form

GivenRelationis in BCNF

Problem 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.

Solution

To check Attribute Closures

(A)+

- Start: {A} A → BCD ⇒ {A, B, C,
- D} From B → D (already have D)
- From D → A (already have A)
- From BC → DE (BC ⊆
- {A,B,C,D}) ⇒ add E
  →{A, B, C, D, E}
  Missing F. Not a key.

(B)+

Start: {B}

- From B → D ⇒ {B, D}
- From D → A ⇒ {A, B, D}
- From A → BCD ⇒ {A, B, C, D}
- From BC → DE (need C, now present) ⇒ {A, B, C, D, E}
- Still missing F. Not a key.

(C)+

- Start: {C}
- No FD fires ⇒ {C} Not a key.

(D)+

- Start: {D}
- From D → A ⇒ {A, D}
  From A → BCD ⇒ {A, B, C, D}
  From BC → DE (have B,C) ⇒ add E
  ⇒ {A, B, C, D, E}
  Missing F. Not a key.

(E)+

- Start: {E}
- No FD fires ⇒ {E} Not a key.

(F)+

- Start: {F}, no FDs apply. Not a key.

(A,F)+

- Start: {A, F}
- From A → BCD ⇒ {A, B, C, D, F}
- From BC → DE ⇒ add E
  {A, B, C, D, E, F} .
  ⇒
  {A, F} is a key.

(B,F)+

- Start: {B, F}
- From B → D ⇒ {B, D, F}
- From D → A ⇒ {A, B, D, F}
- From A → BCD ⇒ {A, B, C, D, F}
- From BC → DE ⇒ {A, B, C, D, E, F}.
  {B, F} is a key.

(C,F)+

- Start:{C,F}
- No FDs fire (need A, B, D) Not a key.

(D,F)+

- Start: {D, F}
- From D → A ⇒ {A, D, F}
- From A → BCD ⇒ {A, B, C, D, F}
- From BC → DE ⇒ add E

⇒ {A, B, C, D, E, F}.
{D, F} is a key.

(E,F)+

- Start:{E,F}, noFDsapply . Not a key.

Check minimality

- {A,F} minimal
- {B,F} minimal
- {D,F} minimal

Candidate Keys

{AF,BF,DF}

Prime vs Non-prime Attributes

- Primeattributes= those that appear in at least one candidate key.
  - Candidate keys = {A,F}, {B,F}, {D,F}
  - Prime attributes = {A, B,, D, F}
- Non-prime attributes = the rest.
  - Non-prime = {E,C}

Normal Form

Givenrelationis1st Normal Form

Problem 5.

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

X ->Y
WZ ->X
WZ ->Y
Y ->W
Y ->X Y
->Z

Thetaskhere istoremovealltheredundantFDsforefficientworkingofthestudentdatabase management system.

Solution

Closure are

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

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

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

Candidate Keys Are

{X,Y,WZ}

Prime vs Non-prime Attributes

- Primeattributes= those that appear in at least one candidate key.
  - o Candidate keys = {X},{Y},{WZ}
  - o Prime attributes = {X,Y,W,Z }
- Non-prime attributes = null;

Normal Form
Givenrelationisin BCNF

Problem 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 relationR1(A,B, C,D, E, F)with functionaldependency setF, alsoall attributes are simple and take atomic values only. Find the highest normal form along with the candidate keys with prime and non-prime attribute.

Solution
Find Candidate Keys

- AF+:
  - o Start with {A, F}.
  - o From A→ B, C, D,E,weget {A, B, C, D, E, F}
    So AF is a candidate key.

A^+ = {A, B, C, D, E} ≠ R1 (F missing).

F^+ = {F} ≠ R1 (F missing).
FD+={F,D,E} ≠ R1 (F missing).
FBC+={F,B,C,D} ≠ R1 (F missing).

Thus, the only candidate key = {A F}.

Prime vs Non-prime Attributes

- Primeattributes= those thatappear in at least one candidate key.
  - o Candidate keys = {AF}
  - o Prime attributes = {A,F }
- Non-prime attributes = {B,C,D,E}

Normal Form
Givenrelation is in 1st normal form