I)Given a database with the following relations:

Student(StudID , StudName ,Gender ,DOB, PlaceofBirth ,DeptID)

Department(DeptID,DeptName)

1.1)What are the Primary Keys of the above relations.

The primary keys of the given relations are:

Student: StudID

Department: DeptID

1.2)If we want a form with StudName and DeptName what SQL statement we will use ?

SELECT StudName, DeptName

FROM Student

JOIN Department ON Student.DeptID = Department.DeptID;

1.3)If we want a form with StudName and DeptName of female students what SQL statement we will use?

SELECT Student.StudName, Department.DeptName

FROM Student

JOIN Department ON Student.DeptID = Department.DeptID

WHERE Gender = 'female';

2)Find the closure attributes of the following relation R and set of functional dependencies FD

Given a relation R(A,B,C,D,E) and FD={CE->D,D->B,C->A)

Find: CE+,CD+ ?

FD= {CE->D,D->B,C->A}

Cách 1:

Find CD+

* We start with {C, D}.
* What columns can we determine, given C and D? We have C -> A and D->B, so we can add A and B to {C, D}+.
* Now {C, D}+ is {C, D, A, B}. Can we add anything else? No. We have one more functional dependency in our set that we did not use: CE -> B. We can’t use this dependency because E is not in {C, D}+.
* Thus, {C, D}+ is { C, D, A, B}.

Find CE+

{CE->D,D->B,C->A)

* We start with {C, E}.
* What columns can we determine, given C and E? We have CE-> D, so we can add D to {C, E}+.
* So, we now have C, E, and D. What else can we add? We have D -> B and C->A so we can add A and B to {C, E}+.
* Thus, {C, E}+ is {C, E, D, A, B}.

SOME EXAMPLES:

Example 1

We are given the relation R(A, B, C, D, E). This means that the table R has five columns: A, B, C, D, and E. We are also given the set of functional dependencies: {A->B, B->C, C->D, D->E}.

What is {A}+?

* First, we add A to {A}+.
* What columns can be determined given A? We have A -> B, so we can determine B. Therefore, {A}+ is now {A, B}.
* What columns can be determined given A and B? We have B -> C in the functional dependencies, so we can determine C. Therefore, {A}+ is now {A, B, C}.
* Now, we have A, B, and C. What other columns can we determine? Well, we have C -> D, so we can add D to {A}+.
* Now, we have A, B, C, and D. Can we add anything else to it? Yes, since D -> E, we can add E to {A}+.
* We have used all of the columns in R and we have all used all functional dependencies. {A}+ = {A, B, C, D, E}.

Example 2

Let’s look at another example. We are given R(A, B, C, D, E, F). The functional dependencies are {AB->C, BC->AD, D->E, CF->B}. What is {A, B}+?

* We start with {A, B}.
* What columns can we determine, given A and B? We have AB -> C, so we can add C to {A, B}+.
* We now have A, B, and C. What other columns can we determine? We have BC -> AD. We already have A in {A, B}+, so we can add D.
* So, we now have A, B, C, and D. What else can we add? We have D -> E, so we can add E to {A, B}+.
* Now {A, B}+ is {A, B, C, D, E}. Can we add anything else? No. We have one more functional dependency in our set that we did not use: CF -> B. We can’t use this dependency because F is not in {A, B}+.
* Thus, {A, B}+ is {A, B, C, D, E}.

Cách 2: R={A,B,C,D,E} F={A->B;B->C;C->D;D->E}

Find {A}+ closure of a set of attributes

Step1: X{A}->X+

Step2: check FD: A->B (AX+) ,B->C(BX+) ;C->D(CX+) ;D->E(DX+)

->add {B} to X+ ,X+={A,B}

->add {C} to X+ ,X+={A,B,C}

->add {D} to X+ ,X+={A,B,C,D}

->add {E} to X+ ,X+={A,B,C,D,E}

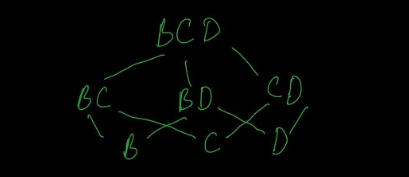
Step 3: do FD for checky conlusion {A}+ ={A,B,C,D,E}

3) Find all the candidate keys of the following relation R and set of functional dependencies FD

Given a relaion R(A,B,C,D,E) and FD={BC->ADE,D->B}

+Find candidate keys:

The attribute in the left hand side of FD:



Calculating the attribute closure:

BCD+={B,C,A,D,E} ->supper key BD+={B,D}

BC+={B,C,A,D,E}->key CD+={C,D,B,A,D,E} ->key

=>candidate keys= {BC,CD}

=> non-key attributes: A,E

+set of FD:

Because BC,CD are candidate keys

BC->A CD->A BC->E CD->E

CHECK partial alepenolent :

Ảnh có chứa văn bản

Mô tả được tạo tự động

=>NOT FD

4) Find the highest normal form of a relation R( P,Q,R,S,T) with Functional Dependency set

FD={Q->P,P->R,QR->S,PR->QT}

+find key :

QPR

QR PR QP

QPR +=Q P R S T PR+=P R Q T S

QR+=Q R S P T QP+=Q P R S T

* KEY= Q,P

WHEN ky contain only one attribute =>2nf

+check 3NF:

Non-key :R,S,T

Q-> ? ->R Q->?->S Q->?->T P->?->R P->?->S P->?->T

\*the relation is in 3NF because the LHS of all FD’s is super keys

LHS

Q,P are keys

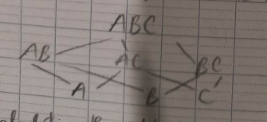
QR+=QRSPT |=> SUPER KEYS

PR+= PRQTS |

=>3NF

Ex1: Given R(A,B,C,D) AND F:{AB->C,BC->D}

In attribute in the LHS of F:



Calculation the attribute closure :

ABC+=A,B,C,D ->key AC+=A,C A+=A

AB+=A,B,C,D ->KEY BC+=B,C,D B+=B

* Candidate {AB}

Super {ABC}

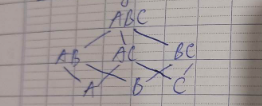
Non-key attribute C,D

Key :AB not have FD : A->C ,A->D,B->C,B->D

=>Second NF

EX2: R={A,B,C,D,E} FD={A->D,B->A,BC->D,AC->BE}

FIND KEY:



+Attribute closure :

ABC+=A,B,C,D,E AB+=A,B,D

AC+=A,C,D,B,E =>KEY BC+=B,C,D,A,E =>KEY

A+=A,D B+=B,A C+=C

=>Candidate key :{AC,BC}

+Check highest NF:

1NF->OK

2NF:

Non-key :D,E

Because AC,BC are keys

AC->D AC->E BC->D BC->E

+Check partial dependent: (v là tích , x là không tích )

A->D v B->D v C->D x

A->E x B->E x C->E x

->Not 2NF

EX3: R=(A,B,C,D,E) FD={BC->D, AC->BE, B->E}

ABC+=ABCDE BC+=BCD C+=C

AB+=ABE A+=A

AC+=ACBED ->KEY B+=BE

BC+=BCD

=>Candidate key :{AC}

CHECK 2NF

Non-key=B D E

Because AC is key

AC->B A->B C->B

AC->D A->D C->D

AC->E A->E C->E

* No violate =>2NF

AMSTRONGS

Example 1: Let F = {AB ->C, C->A}. CMR: BC->ABC

(1) C->A (assumption)

(2) BC->AB (growth (1))

(3) AB->C (assumption)

(4) AB->ABC (growth (3))

(5) BC->ABC (bridging 2 & 4)

Example 2: Given R(A,B,C,D,E,F,G,H,I,J). F = {AB->E,AG->J, BE->I, E->G, GI->H}. CMR AB->GH.

(1) AB->E (gt)

(2) AB->B (reflex)

(3) AB->BE (combination of 1 & 2)

(4) BE->I (gt)

(5) AB->I (bridging 3 & 4)

(6) E->G (gt)

(7) AB->G (bridging 1 & 6)

(8) AB->GI (combining 5 & 7)

(9) GI->H (gt)

(10) AB->H (bridging 8 & 9)

(11) AB->GH (combined 7 & 10)