Practice problems on closure

Practice Problems on Functional Dependencies

Find if a given functional dependency is implied from a set of Functional Dependencies:

6 fd given

1. For: A → BC, CD → E, E → C, D → AEH, ABH → BD, DH → BC
   a. Check: BCD → H
   b. Check: AED→C
2. For: AB → CD, AF → D, DE → F, C → G, F → E, G → A
   a. Check: CF → DF
   b. Check: BG → E
   c. Check: AF → G
   d. Check: AB → EF
3. For: A → BC, B → E, CD → EF
   a. **Check: AD → F**

Source: http://www.edugrabs.com/membership-test-for-functional-dependency/

Fd closure method

given R(A BCDEH)

1. For: A → BC, CD → E, E → C, D → AEH, ABH → BD, DH → BC
   a. Check: BCD → H

new fd

Armstrong rules + 3 extra rules = fd closure
fd +

CD → E
using E → C

① D → AEH
By Augmentation of C
② CD → C AEH

③ CD → CAEH
Augment B on this

④ BCD → BCAEH
using reflexivity
⑤ BCD → H (trivial)
Thus it implies

$AB \to CD$

~~$AF \to D$~~

$DE \to F$

$C \to G$

$F \to E$

$G \to A$

~~$Age \to exp$~~

~~$Agep\ Age \to exp$~~

$CFF = CF$

$CFFFF = CF$

$CCCF$

Can $CF \to DF$?

Ans :- $C \to G$ and $G \to A$

∴ By transitivity $C \to A$

Augmentation of F

$CF \to AF$ } transitivity

using $AF \to D$

∴ $\boxed{CF \to D}$

Augment with F

$CFF \to DF$

is written as

$CF \to DF$

so implied

Attribute closure Practice problems

1. For: AB → CD, AF → D, DE → F, C → G, F → E, G → A
   a. Check: CF → DF
   b. Check: BG → E
   c. Check: AF → G
   d. Check: AB → EF

Trivial -> reflexivity

Attribute closure

1. For: AB → CD, AF → D, DE → F, C → G, F → E, G → A
   a. Check: AF → G
   b. Check: AB → EF

AB → EF ?

$(AB)^+ = ABCDG$

$EF \not\subset (AB)^+$

AB → EF cannot be implied

AF → G ? (Reachability)

$(AF)^+ = AFDE$

$G \not\subset (AF)^+$

∴ AF → G can not implied

If $(AF)^+ = AFDEG$

AF → G

Practice Problems on Functional Dependencies

PPD

Find Candidate Key using Functional Dependencies:

1. Relational Schema R(ABCDE). Functional dependencies: AB → C, DE → B, CD → E
2. Relational Schema R(ABCDE). Functional dependencies: AB → C, C → D, B → EA

Candidate key is a minimum

super key

R(ABCDE)

Source: http://www.edugrabs.com/how-to-find-candidate-key-using-functional-dependencies/

$ABCDE^+ =$

$ABDE^+ =$

$BD^+ =$ B

Find candidate keys: Solved

R(ABCDE)

- Relational Schema R(ABCDE). Functional dependencies: AB → C, C → D, B → EA

Find attribute closure of all attribute (if any (attribute)$^+$ either single or in combination has all the attributes in the Relation & is minimum = CK

Hint: check if any attribute not on RHS

$B^+ = BEACD = R$

∴ B is a candidate key

Caution: there can be more than 1 CK

2 attributes not on RHS eg: X & Y

$X^+ = ?$ $\subseteq R$ then CK

$Y^+ =$ $\subset R$ then CK

else

$(XY)^+ = ???$ $\subset R$ then CK

if not ~~then~~ next combination.

$R = (R_1\ R_2\ X\ Y)$

$(X Y R_1)^+ = ???$ $\subset R$ then CK

$(X Y R_2)^+ = ???$ $\subset R$ then CK

more than 1 CK, it may also be in combinations

Practice Problems on Functional Dependencies

PPD

Find Super Key using Functional Dependencies:

1. Relational Schema R(ABCDE). Functional dependencies: AB → C, DE → B, CD → E
2. Relational Schema R(ABCDE). Functional dependencies: AB → C, C → D, B → EA

superset of CK is Superkey

Source: http://www.edugrabs.com/how-to-find-super-key-from-functional-dependencies/

Finding ~~super~~ keys

- Relational Schema R(ABCDE). Functional dependencies: AB → C, C → D, B → EA

Find CK then its ~~superset~~

$B^+ = A\ BCDE$ ∴ B is CK.

Find superset of B

B BA C BCD B ACD B CDE
BA BAD BCE BACE ABCDE
BC
BD BAE BDE BADE
BE

Are superkeys?