SACHIN DUHAN
2K17/MCO/087

DBMS ASSIGNMENT-2

Q.1 — — — ?

The functional dependencies are $XY \rightarrow Z$, $XZ \rightarrow Y$, $YZ \rightarrow X$
Since in all these FDs if the value at left side is same the value at right is also same.

Q.2 — — — ?

(A) $OP \rightarrow M$

$f_3)$ $O \rightarrow N$

Applying Augmentation rule:

$OP \rightarrow NP \rightarrow f_4$.

$f_2)$ $NP \rightarrow M$

Applying transitive rule to f_4 & f_2, we get

$OP \rightarrow M$

Hence prooved.

(B) $NO \rightarrow M$

This FD can be derived the given FDs Counter Example:

M	N	O	P
m_1	n_1	o_1	p_1
m_2	n_2	o_2	p_2
m_3	n_3	o_3	p_3
m_4	n_4	o_4	p_4
m_5	n_5	o_5	p_5

(C) $MP \rightarrow N$

~~This FD cannot be derived from the Given FDs~~

~~Corka~~ $f_1)$ $M \rightarrow O$, $f_3)$ $O \rightarrow N$

Applying transitive rule, we get

Flexivity: $NP \rightarrow N$ — $(F(6))$

Since N is a subset of NP

Applying Augmentation rule to f_5.

$MP \rightarrow NP$ (f_7)

Applying transitive rule to f_6 & f_7

$MP \rightarrow N$

Hence prooved.

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(d) $MO \rightarrow P$

The FD cannot be derived from FDs Counter Exam

M	N	O	P
m_1	n_1	o_1	p_1
m_2	n_2	o_2	p_2
m_3	n_3	o_3	p_3
m_2	n_2	o_2	p_2
m_5	n_5	o_5	p_5.

Q.3 — — ——?

(A) $\{A\}^+ = \{A, D\}$

(B) $\{A, B\}^+ = \{A, B, D, C\}$

(C) Step 1 Split

$A \rightarrow D$ (1)

$B \rightarrow C$ (2')

$B \rightarrow D$ (2'')

$AC \rightarrow D$ (3)

Step : 2 Delete Duplicate FDs

No Duplicate Set remains. Same.

Step : 3 In (3) 'C' is Extraneous.

$A \rightarrow D$ (1)

$B \rightarrow C$ (2')

$B \rightarrow D$ (2'')

$AC \rightarrow D$ (3)

Step : 4. Removing (3') as it is redundant.

$A \rightarrow D$ (1)

$B \rightarrow C$ (2')

$B \rightarrow B$ (2'')

- no thing is extraneous
- all RHS are Single attributes.
- checking if final and initial set of FDs are equivalent or not.

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let $E = \{A \to D, B \to CD, AC \to D\}$.

$F = \{A \to D, B \to C, B \to D\}$

Checking if F covers E

In E

$A \to D$

Computing A+ Using FDs in F

$A+ = \{A, D\}$

It contains D

$B \to CD$

Computing B+ Using F

$B+ = \{B, C, D\}$

It contains C & D.

$AC \to D$.

Computing AC+

$AC+ = \{A, C, D\}$

It contains D

∴ F covers E

Checking if E covers F.

$A \to D$

Computing A+ Using E

$A+ = \{A, D\}$

It contains D.

$B \to C$

Computing B+ Using E

$B+ = \{B, C, D\}$

It contains C

∴ E covers F.

$B \to D$

Computing B+ using E+

$B+ = \{B, C, D\}$

It covers D

∴ E covers F.

∴ E & F are Equivalent

∴ F is canonical cover of E

(D) $F: \{A \to D, B \to C, B \to D\}$

$A+ \{A, D\}$ $B+ = \{B, C, D\}$

$\{A, D\}+ = \{A, B, C, D\}$

AB is a super key because it's closure contains all the attributes in their closure

So AB is a Candidate key.

Q.4 ———— ?

(i) $\{ABC, CDE, EG\}$

Dependency preserving

let $R_1 = ABC$, $R_2 = CDE$, $R_3 = EG$

$AB \to C$ is preserved in R_1

$E \to G$ is preserved in R_3

Closure of R_1

$A+ = \{A\}$

$B+ = \{B, D\}$ but D is not in R_1 so $= \{B\}$

$AB+ = \{A, B, C, D\}$ but D is not in R_1 so

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$AB \to C$ — (F_1)

$AC+ = \{A, C\}$

$BC+ = \{D\}$

$E+ = \{E, G\}$ but G is not in R_2 so.

$= \{E\}$

$CD+ = \{C, D\}$

$CE+ \{C, E, G\}$ but G is not in R_2 so.

$= \{CE\}$

$DE+ = \{DEG\}$ but G is not in R_2 so $\{D, E\}$

Closure in R_3

$E+ = \{E, G\}$

$E \to G.$

$G+ = \{G\}$

$AB \to C$ & $E \to G$ are preserved but not $AG \to E$, So the decomposition is not dependency preserving to lossless.

(ii) $\{ABCD, AE\}$

a) dependency preserving

$AB \to C$ is preserved in ABCD,

$AG \to E$ is preserved in AEG

$B \to D$ is preserved in ABCD.

$E \to G$ is preserved in AEG

∴ The decompositions are dependency preserving

b) lossless.

1) $ABCD \cup AEG = ABCDEG = R$

2) $ABCD \cap AEG = A \neq \emptyset$

3) $ABCD \cap AEG = A$

$A+ = \{A\} \neq \{ABCD\}$ or $\neq \{AEG\}$.

∴ The decomposition are not lossless.

(iii) $\{ABCE, BD, AEG\}$

$AB \to C$ is preserved in ABCE

$AG \to E$ is preserved in AEG

$B \to D$ is preserved in BD

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$E \to G$ is pressored for AEG.

∴ The decomposition are depending

b) lossless.

1) $ABCD \cup AEG = ABCDEG = R$.

2) $ABCD \cap AEG = A = \emptyset$

3) $ABCD \cap AEG = A$.

$A+ = \{A\} \neq \{A, B, C, D\}$ or $\neq \{A, E, G\}$

∴ The decompocibons are not lossless.

(iv) ~~R~~ $= \{BDEG, ABC\}$

a) $R_1 = BDEG$

Closure in $R_1 = BDEG$.

$B+ = \{B D\}$

$B \to D$

$D+ \{D\}$

$E+ = \{E, G\}$

$E \to G$

$G+ = \{G\}$

$BD+ = \{B, D\}$

$DE+ = \{D, E, G\}$

$DE = G$

$EG+ = \{B, E, D, G\}$

$BE \to DG$

$BG+ = \{B, G, D\}$

$BG \to D$

$DG = \{D, G\}$

$BDE+ = \{B, D, E, G\}$

$BDE \to G$.

$DEG+ = \{DEG\}$

$BEG+ \{B, E, G, D\}$

$BDG+ = \{B, D, G\}$.

$BEG \to D$.

The FDs in R_1

$B \to D$, $E \to G$,.

Closure in $R_2 = ABC$

$A+ = \{A\}$

$AC+ = \{A, C\}$

$B+ = \{B, D\}$ but D is not in R_2 So.

$= \{B\}$

$C+ = \{C\}$

$AB = \{ABC\}$

$BC = \{B, C, D\}$

$= \{B, C\}$

the dependency $\begin{matrix} AB \to C \\ AG \to \end{matrix}$ is not pressered.

b) $BDEG \cup ABC$

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b) 1) BDEG ∪ ABC = ABCDEG = R.

2) BDEG ∩ ABC = B = ∅

3) BDEG ∩ ABC = B.

B+ = {B, D} ≠ {BDEG} + {ABC}.

∴ The Decomposition is not lossless.

Q.5 — ——— ?

A) For All the Candidate keys of R.

A+ = {A, B, D}　　C+ = {C}

B+ = {B D}　　D+ = {D}

AB+ = {A, B, D}　　AC+ = {A, B, C, D}

　　CD = {C, D}.

BC+ = {B, C, A, D}

BC is a superkey, AC is superkey

AD = {A, B, D}, BD+ = {B, D}

ABC+ = {A B, C, D}　BCD+ = {B, C, D, A}

ACD = {A, C, D, B}, ABD+ = {A, B, D}

ABC, BCD, ACD are super keys

∴ AC & BC are Candidate keys

B) Assuming No multivalued Attributes

R is in 1NF.

A, B, C are prime attributes., D is non prime attribute, B → D, i.e a subset of Candidate key BC which B determines D so R has dependency

R is not in 2NF

∴ R is not in 3NF and BCNF.

c) According to Alogrithm:

S = {R}

Picking A → B

S = {AB, ACD}

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∴ The decomposition is $\{AB, ACD\}$

1) $AB \cup ACD = ABCD = R$

2) $AB \cap ACD = A\cancel{BCD} = \cancel{\emptyset}$

3) $AB \cap ACD = A$

$A^+ = \{A, B\}$ (and D which is not in AB)

∴ $A \rightarrow AB$.

∴ $\{AB, ACD\}$ is lossless decomposition.

$BC \rightarrow A$ is not pressured in this decomposition

So, it is not a dependency preserving.

D) let us consider the decomposition

$\{ABC, BD\}$

1) $AB \cup BD = ABCD = R$

2) $ABC \cap BD = B \neq \emptyset$

3) $ABC \cap BD = B$, $B \rightarrow R_2\ (BD)$

∴ The decomposition is lossless.

1) Both Decomposed relations are in 1NF as there are no multivalued attributes.

2) There is not partial dependency so they are in 2NF

3) There is ~~not~~ no transitive dependency, so they are in 3NF.