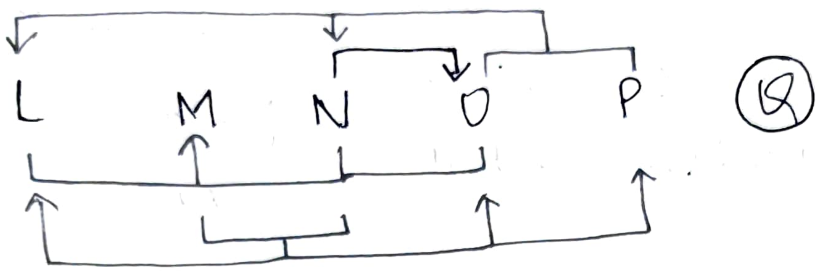
A1 :-

HOMEWORK - 7

You have a relation R (L, M, N, O, P, Q) and a set of functional dependencies F = {LNO→M, MN→LOP, N→O, OP→LN}.

Edge Diagram :-



a) Can we Infer NP→LM from F?

⇒ N→O, OP→L } NP→L

Therefore NP→L is true.

⇒ Now Let's check NP→M.

NP→L
NP→N
NP→P
NP→O.

Therefore NP→NLO
NLO→M.
NP→M is True

∴ Yes, because NP→NPOLM, so NP→LM is True.

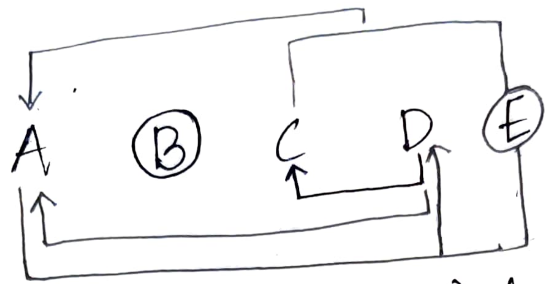
b) Can we Infer NQ→LO from F?

⇒ Check if NQ→L
where N→O.
PO→L.

L can be derived NM→L, PO→L. } But L cannot be derived using NQ
∴ NQ→LO is not true to LO.
therefore it is not possible.

i] Find all the Candidate keys of the Relation R(A B C D E) with FD's: D→C, CE→A, D→A and AE→D. ②

Edge Diagram:-



→ The Entire relation R(A B C D E) has 2 keys B and E which appear on the right hand side of functional depedencies, which should always be included on all the candidate keys.

$\{D\}^+ \rightarrow \{DCA\}$.

$\{CE\}^+ \rightarrow \{CEAD\}$.

$\{AE\}^+ \rightarrow \{AEDC\}$.

⇒ Let us check the right hand side of the fn depedencies.

$\{BDE\}^+ = \{BDECA\}$

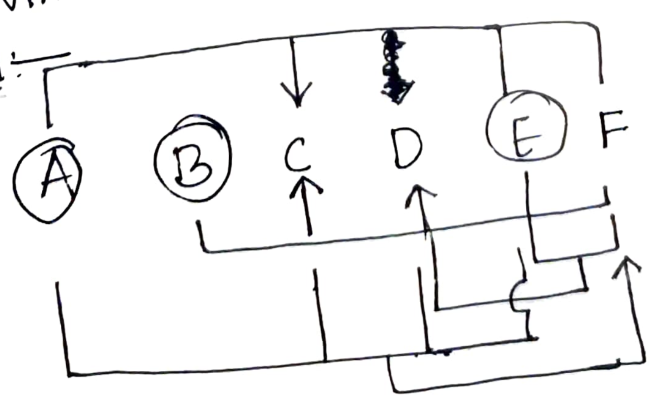
$\{BCE\}^+ = \{BCEAD\}$.

$\{ABE\}^+ = \{ABECD\}$.

⇒ The set of attributes {BDE}, {BCE} and {ABE} which gives the set of all attributes of the relation R.

ii] Determine all the candidate and superkeys of the relation. R(ABCDEF) with FD's: AEF→C, BF→C, EF→D and ACDE→F.

Edge Diagram:-



⇒ Lets find the closure of functional depedencies . (3)

{AEF}+ → {AEFCD} .

{BF}+ → {BFC} .

{EF}+ → {EFD} .

{ACDE}+ → {ACDEF} .

No closures determines all the attributes of R .

⇒ Lets check the Right hand side of the functional depedencies which are to be present as the part of Candidate Key A, B, E .

B to closure of {ABEF}, then {ABEF}+ → {ABEFCD} .

B to closure of {ABCDE} then {ABCDE}+ → {ABCDEF} .

for FDs BF → C and EF → D, {BF}+ → {BFC} .

Add A & D {ABDF}+ → {ABDFC} .

Add E ~~so~~ ~~to~~ the closure of {BFAD} then .

{ABDEF}+ → {ABCDEF} .

⇒ The set of attributes {ABEF} and {ABCDE} gives the set of all attributes of relation R .

⇒ Hence, the Candidate keys of the relation R(ABCDEF) and are {ABEF} and {ABCDE} .

⇒ The Super keys of the Relation R(ABCDEF) are {ABDEF}, {ABCEF} and {ABCDEF} .

A3:- Minimal Cover:-

Find all minimum coverses for the following set F of functional depedencies X→Z, XY→Z, Z→UT, ZU→T, ZW→XY, WT→Z.

Given set Functional depedencies.

X→Z, XY→Z, Z→UT, ZU→T, ZW→XY, WT→Z

⇒ The minimal cover of F functional dependencies

→ Every single Attribute on the Right hand Side must have a dependency in F.

⇒ Z→UT

⇒ $\boxed{Z \to U, Z \to T.}$

→ Removing all extraneous attributes such as α→β and αγ→β then γ is an extraneous attributes.

→ X→Z and XY→Z then Y is extraneous so removing it becomes ⇒ $\boxed{X \to Z}$.

→ Removing redudant functional dependencies of F. such as α→β, α→β (removing one of similar one. α→β)

In the above given F functional dependecies.

a) Convert Right Hand Side Attribute into single.

→ Z→U

Z→T

ZW→X

ZW→Y

b) Remove extraneous attribute dependencies.

→ X→Z

XY→Z

X→Z

→ Z→T

ZU→T

Z→T

c) Removing all the redudand functional dependencies of F.

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→ $X \to Z$

$X \to Z$

$Z \to U$

$Z \to T$

$Z \to T$

$ZW \to X$

$ZW \to Y$

$WT \to Z$.

The Minimal Cover of the given F of functional depencies are

⇒ $X \to Z$, $Z \to U$, $Z \to T$, $ZW \to X$, $ZW \to Y$, $WT \to Z$.

A4

Consider the following set of F.Ds. Determine if FD 1 is equivalent to FD2 or to FD3. (6)

FD1:
{ BC → D, ACD → B, CG → B, CG → D, AB → C, C → A, D → E, BE → C, D → G, CE → A, CE → G }.

FD2:
{ AB → C, C → A, BC → D, CD → B, D → E, D → G, BE → C, CG → D }.

FD3:
{ AB → C, C → A, D → G, BE → C, CG → D, CE → G, BC → D, CD → B, D → E }.

You must show closure of each LHS attributes on the left hand side of each FD_i where i = {1, 2, 3} via going through the other FD set.

⇒ If all the Equivalent conditions are FD1 covers FD2 and FD2 covers FD1.

The equivalent with FD2 :-

lets checks if FD2 covers FD1:

FD1: BC → D
AB → C
C → A
D → E.
BE → C
D → G.
ACD → B.
CG → B
CG - D.

⇒ The rest of the relations in FD1:

ACD → ACDEG so, ACD → B.

CG → CGABEG so CG → B, CG → D.

CE → CEA, so CE → A but CE → G in FD1 is not covered by FD2.

Finally FD1 & FD2 are similar and are not equivalent

⇒ Equivalent Conditions of FD1 covers FD3 and FD3 covers FD1.
equivalent with FD3: (7)

The relations of FD1:

$BC \to D$
$CG \to D$
$AB \to C$
$C \to A$
$D \to E$
$BE \to C$
$D \to G$.
$CE \to G$ are already in FD3.

⇒ The rest of the relations in FD1:

$ACD \to ACDGEB$ so $ACD \to B$
$CG \to CGDEAB$ so, $CG \to B$.
$CE \to CEGADB$ so $CE \to A$.

As a result FD3 covers FD1.

Similarly lets check if FD1 covers FD3:

$AB \to C$.
$C \to A$
$D \to G$
$BE \to C$
$CG \to D$
$CE \to G$
$BC \to D$
$D \to E$ are not in FD1.
$CD \to CDAEGB$ so $CD \to B$.

As a result FD1 covers FD3, therefore they are equivalent.