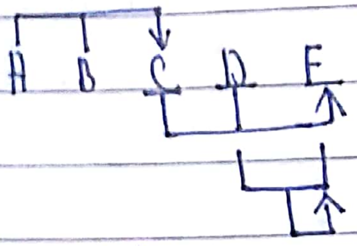
Tut 10

1:- given R(ABCDE)

AB → C

CD → E

DE → F



i) $(AB)^+ = ABC$

∴ closure of AB cannot determine all attributes

∴ AB is not candidate key.

ii) ABD does not have an incoming edge

∴ that's for sure they will form a candidate key.

$(ABD)^+ = ABCDEF$

∴ Yes it's a candidate key.

2:- given R(A, B, C, D, E, F, G, H, I, J)

AB → C

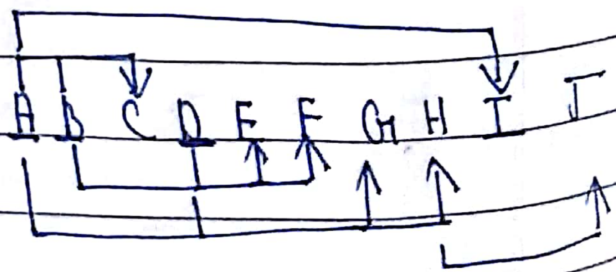
BD → EF

AD → GH

A → I

H → J

⟹



clearly ABD are not having any edges ∴ ABC will be part of key:–

$(ABD)^+ =$ ABDCEFGHIJ

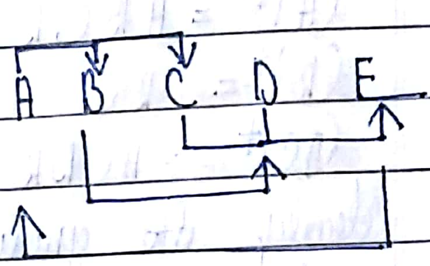
clearly ABD is a candidate key and other combination of it with CEFGHIJ will act as super key.

3. given $A \to BC$

$CD \to E$

$B \to D$

$E \to A$



$(A)^+ =$ ABCDE

$(CD)^+ =$ CDEAB

$(B)^+ =$ BD

$(E)^+ =$ EABCD

~~ABCDE~~

$(A)^+ =$ ABCDF — ∴ A is a candidate key

$(B)^+ =$ BD — E is also an candidate key

$(C)^+ =$ C

$(D)^+ =$ D

$(E)^+ =$ EABCD

$\boxed{B}\boxed{C}\boxed{D}$

B D

Now B C D are failures:–

$(BC)^+ =$ ~~BCD~~ BCDEA ∴ a candidate key

$(BD)^+ =$ BD

$(CD)^+ =$ CDEAB ∴ a candidate key.

∴ candidate keys are A, E, BC, CD.

8:- given :-

For F

$A \to B$

$B \to C$

$AC \to D$

For G

$A \to B$

$B \to C$

$A \to D$

closure of F using G.

$(A)^+ = ABCD$

$(B)^+ = BC$

$(AC)^+ = ACDB$

clearly the given FD's under F are ~~der~~ equivalent to the derived ones.

$\therefore F \subseteq G$.

similarly closure of G using F

$(A)^+ \to ABCD$

$(B)^+ = BC$

clearly the given FD's are under G are equivalent to F (derived ones)

$F \subseteq G$

$\because$ they both are subset of each other

$\therefore$ they are equivalent.

7:- given R(ABCDEFGH)

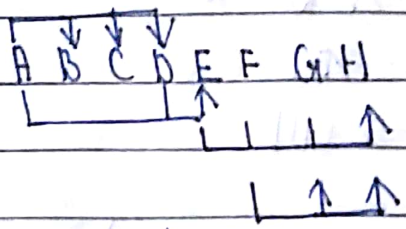
A → BCD

AD → E

EFG → H

F → GH

a) Soln



clearly A and F does not have any edges directed towards them ∴ that's for sure they will be a part of candidate key.

$(AF)^+ = AFBCDEGH$

clearly (AF) is only the ~~primary~~ candidate key.

b) Step 1: decomposing

A → B $\Rightarrow (A)^+ = ABCDE$

A → C $\quad (A)^+ = ACDE$ (ignoring 1st FD)

A → D $\Rightarrow (A)^+ = ABCDE$

AD → E $\quad (A)^+ = ABDE$ (ignoring 2nd FD)

EFG → H $\Rightarrow (A)^+ = ABCDE$

F → G $\quad (A)^+ = ABC$ (ignoring 3rd FD)

F → H

from 1st three

A → BCD will not be removed.

$(AD)^+ = ADBCE$

$(AD)^+ = ABCD$

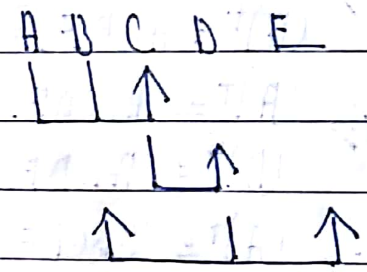
similarly 2nd will not be removed.

$(EFG)^+ = EFGH$
$(EFG)^+ = EFGH$
this will be removed.

hence resulting is:—
$A \rightarrow BCD$
$AD \rightarrow E$
$F \rightarrow GH$

6. given $R(A,B,C,D,E)$
$AB \rightarrow C$
$C \rightarrow D$
$D \rightarrow B$
$D \rightarrow E$

a) $(D)^+ = DBE$
b) $(AB)^+ = ABCDBE$

b) 

clearly A does not have any incoming edge ∴ A will be a part of candidate key.

$(A)^+ = A$ (∵ not c.k) A B C ~~D~~ E
$(AB)^+ = ABCD$ (yes c.k)
$(AC)^+ = AC$
$(AD)^+ = ADBEC$ (yes c.k)
$(AE)^+ = (AE)^+$
$(CE)^+ = CE$.

ABCDEGH

∴ AB and AD are candidate key.

5. given $AB \to C$ | $(AB)^+ = ABC$
$C \to A$ | $(AB)^+ = AB$
$BC \to D$ | $(C)^+ = CA$
~~$ACD \to B$~~ | $(C)^+ = C$
~~$D \to E$~~ | $BC = BCDEGCA$
~~$D \to G$~~ | $BC = BCA$
~~$BE \to C$~~ | $(ACD)^+ = ACDEBDEG$
~~$CG \to B$~~ | $(ACD)^+ = ACDEGB$
$CG \to D$
$CE \to A$ | $(D) = DE$
$CE \to G$

$(BE)^+ = BECADEG$
$(BE)^+ = BE$

$(CG) = CGBDEA$
$(CG) = CGDEGAB$

$(CG) = CGDEA$

4. i)

A	B	C
a_1	b_1	c_1
a_2	b_2	c_1
a_3	b_3	c_3
a_4	b_4	c_3

ii)

A	B	C
a_1	b_1	c_1
a_2	b_1	c_2
a_3	b_2	c_1
a_4	b_4	c_4

iii)

A	B	C
a_1	b_1	c_1
a_1	b_2	c_1
a_2	b_1	c_2
a_3	b_3	c_3

5:- $AB \to C$ $\qquad (AB)^+ = ABCDEG$

$C \to A$ $\qquad (AB)^+ = AB$

$BC \to D$ $\qquad (C)^+ = AC$

$\cancel{ACD \to B}$ $\qquad (C)^+ = C$

$D \to E$ $\qquad (BC)^+ = BCADEG$

$D \to G$ $\qquad (BC)^+ = \cancel{BCADEG}$

$BE \to C$ $\qquad ACD = ABCDCEG$

$\cancel{CG \to B}$ $\qquad ACD = ACDEGB$

$CG \to D$ $\qquad D^+ — DEG$

$CE \to A$ $\qquad D — DG$

$CE \to G$

DEG

DE

$BE \to BECADG$

$(BE) \to DE$

$CG \to B$ $\qquad CBGDEA$

$CG \to \cancel{CDDEA}$

$CG — CGDE\cancel{B}AB$

$CE \to CEA\cancel{B}$

$AB \rightarrow C$

~~E~~

$A^+ = A$

$B^+ =$

$\cancel{AB} \rightarrow C$

$C \rightarrow A$

$\cancel{BC} \rightarrow D$

$D \rightarrow E$

$D \rightarrow G$

$\cancel{BE} \rightarrow C$

$CG \rightarrow D$

$CE \rightarrow A$

$CE \rightarrow G$

BC —

C BDEG

$(AB)^+ = ABCDEG$

$A^+ = A$

$C^+ = CA$

$BC = BCADEG$

B

Ans: $AB \rightarrow C$

$C \rightarrow A$

$BC \rightarrow D$

$D \rightarrow EG$

$BE \rightarrow C$

$CG \rightarrow D$

$CE \rightarrow AG$

[Canonical cover]

X — X