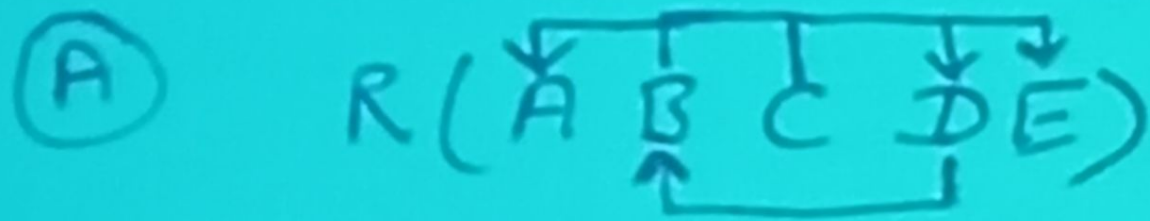Example

(A) $R(A \; B \; C \; D \; E)$

$BC \rightarrow ADE$

$D \rightarrow B$

C is not having incoming edge

$\{C\}^{+} - \{C\} \searrow$ not a candidate Key

$\{CA\}^{+} - \{AC\} \; \times$

$\{CB\}^{+} - \{BCADE\} \; \checkmark$ Key

$\{CD\}^{+} - \{CDBAE\} \; \checkmark$ Key

$\{CE\}^{+} - \{CE\} \times$

$\{ACE\}^{+} - \{ACE\} \times$

$(A+B)$

we have two candidate Key (BC) & (CD)

Example B

$R(ABCDEF)$
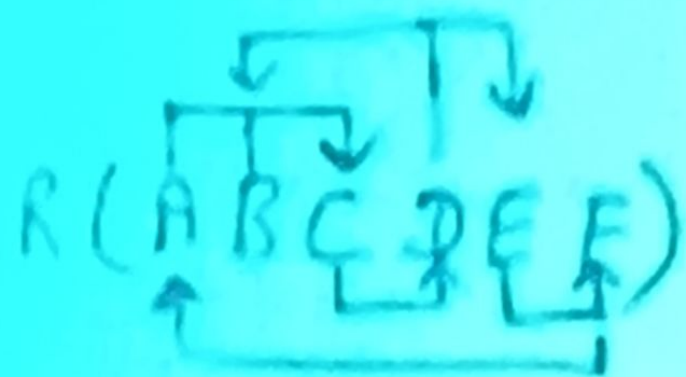
$AB \rightarrow C$

$C \rightarrow D$

$D \rightarrow BE$

$E \rightarrow F$

$F \rightarrow A$

All attributes have incoming edge

$\{A\}^+ - \{A\}$ X

$\{B\}^+ - \{B\}$ X

$\{C\}^+ - \{CDBEFA\}$ ✓ Key

$\{D\}^+ - \{DBEFAC\}$ ✓ Key $(,/+B)$

$\{E\}^+ - \{EFA\}$ X

$\{F\}^+ - \{FA\}$ X

We will take combination of non key attributes

$\{AB\}^+ - \{ABCDE\}$ Key $\{BE\}^+ - \{BEFACD\}$ ✓ Key

$\{AE\}^+ - \{AEF\}$ ✗ $\{BF\}^+ - \{BFACDE\}$ ✓ Key

$\{AF\}^+ - \{AF\}$ ✗ $\{EF\}^+ - \{EFA\}$ ✗ Key

Again take combination of non key attributes

$\{AEF\}^+ - \{AEF\}$ ✗

Total we have 5 candidate Keys

$\{C, D, AB, BE, BF\}$ ✓

Finding Candidate Key

Examples

1.) R(A B C D E F G H)

$AB \longrightarrow C$

$A \longrightarrow DE$

$B \longrightarrow F$

$F \longrightarrow GH$

$AB \longrightarrow C$

$A \longrightarrow DE$

$B \longrightarrow F$

$F \longrightarrow GH$

$R(ABCDEFGH)$

$(AB)^+ = R$ or $\{A,B,C,D,E,F,G,H\}$

Hence (AB) is the Candidate Key

2.) R(A B C D E F G H)

② R(A B C D E F G H)

$$AB \longrightarrow C$$
$$BD \longrightarrow EF$$
$$AD \longrightarrow G$$
$$A \longrightarrow H$$

R(A B C D E F G H)

$$AB \longrightarrow C$$
$$BD \longrightarrow EF$$
$$AD \longrightarrow G \qquad (ABD)^+ = R$$
$$A \longrightarrow H \qquad (ABD)$$
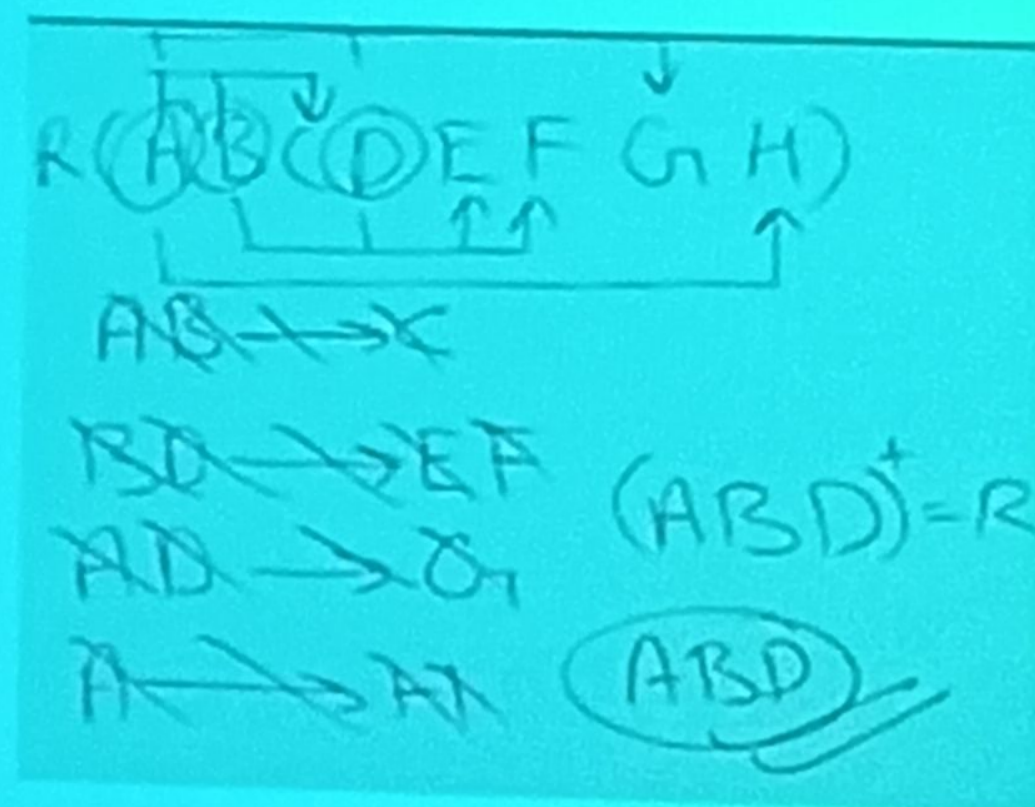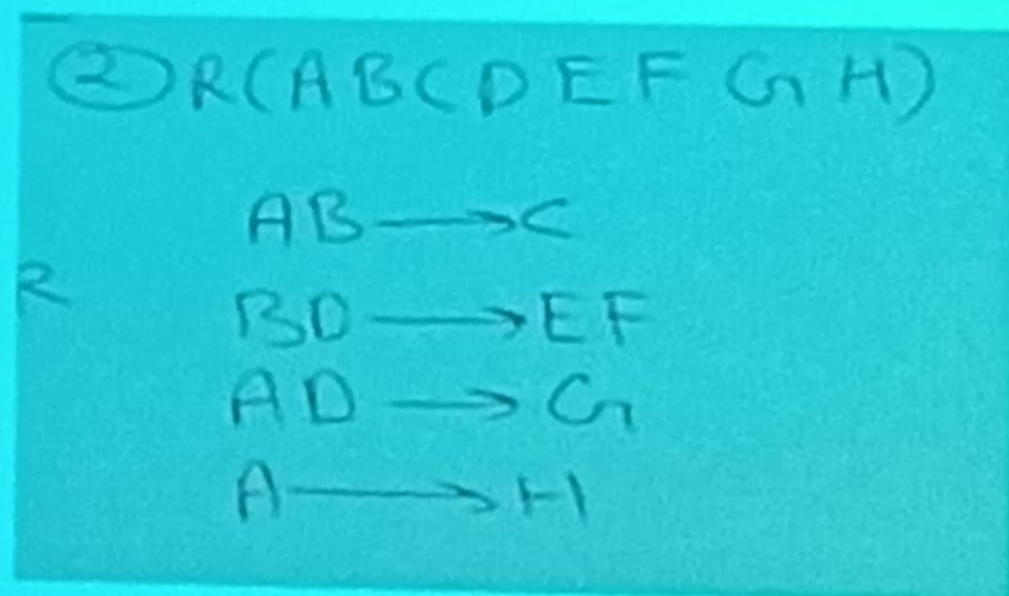
ABD is candidate key

3.) R(A B C D E)
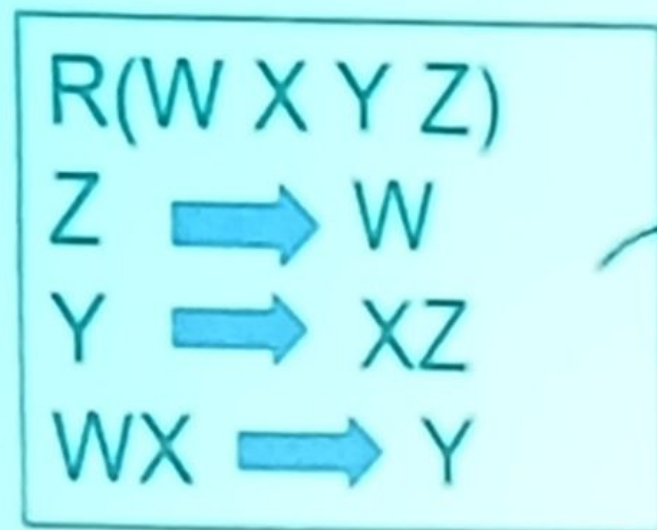
R(A B C D E)

$$AB \longrightarrow CD$$
$$D \longrightarrow A$$
$$BC \longrightarrow DE$$

R(A B C D E)

$$AB \longrightarrow CD$$
$$D \longrightarrow A$$
$$BC \longrightarrow DE$$

$(B)^+ \neq R$

AB
BC
BD

BE(,X+B)
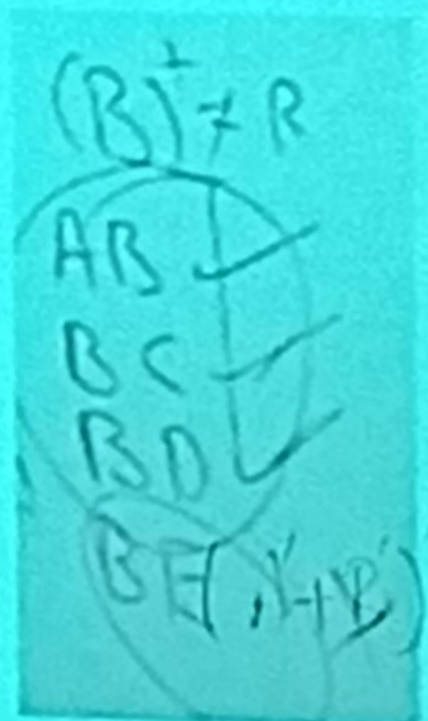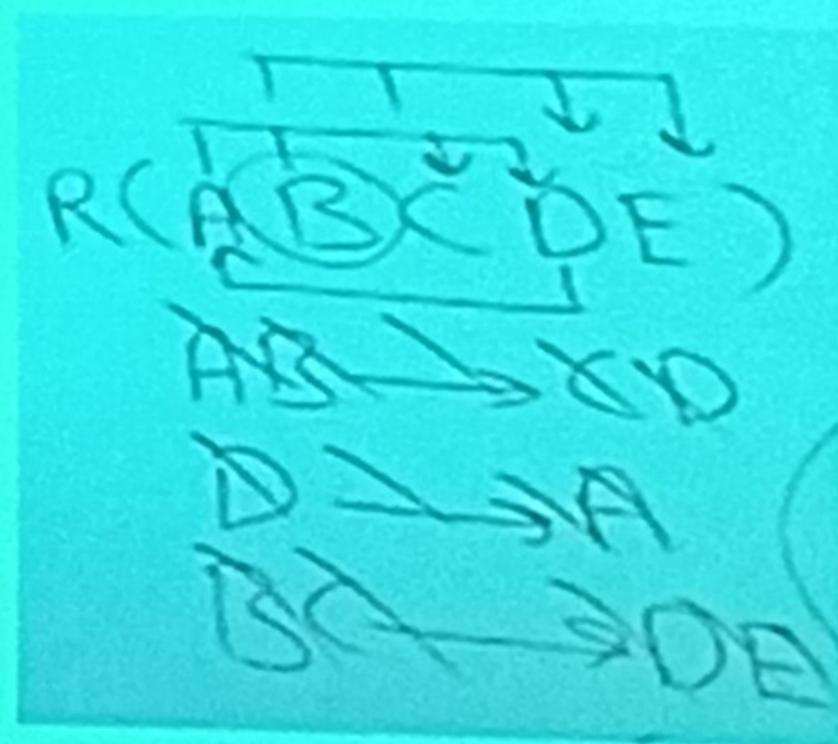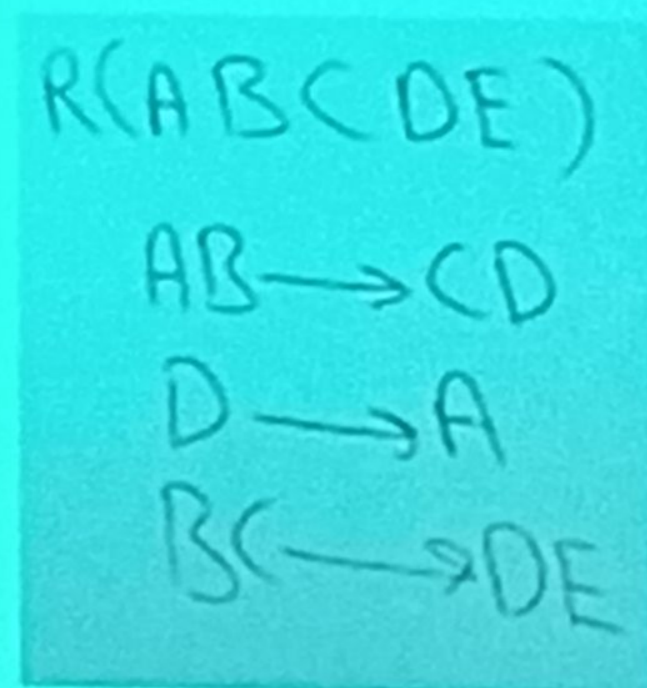
AB, BC, BD are candidate keys

4.) R(W X Y Z)

$W^+ = W$

$X^+ = X$

$Y^+ = \{YXZW\}$

$Z^+ = \{ZW\}$

R(W X Y Z)

Z ⟹ W

Y ⟹ XZ

WX ⟹ Y

$\{WX\}^+ = \{WXYZ\}$

$\{WZ\}^+ = \{WZ\}$

$\{XZ\}^+ = \{XZWY\}$

Candidate Keys :-

$\{Y, \{WX\}. \{XZ\}\}$