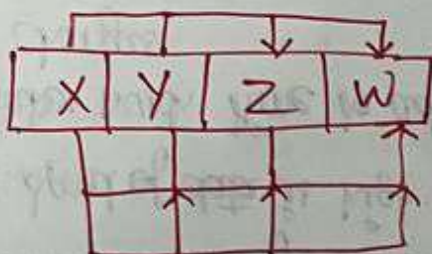


Q.1) Determine S.K. & C.K. for given relation R.
 $R(XYZW)$, and $FD = \{XY \rightarrow Z, XY \rightarrow W \text{ and } X \rightarrow YZW\}$

sol.



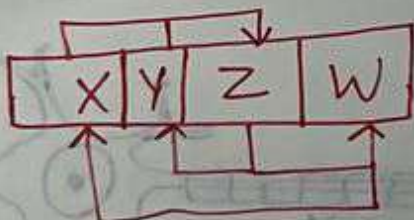
$$X^+ = \{X, Y, Z, W\}$$

$\therefore X$ is the only C.K.

X, XY, XYZ are all S.K. [Max. $2^n - 1$ S.K.]

Q.2) $R(XYZW)$ and $FD = \{XY \rightarrow Z, Z \rightarrow YW, W \rightarrow X\}$

sol.



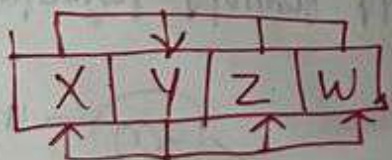
$$XY^+ = \{XY, Z, W\}$$

$$Z^+ = \{Z, Y, W, X\}$$

$$W^+ = \{W, X\}$$

XY & Z are the C.K.

Q.3) $R(XYZW)$, and $FD = \{Y \rightarrow XZW, XZW \rightarrow Y\}$



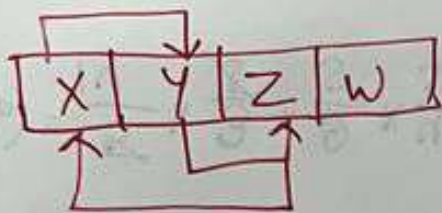
$$XZW^+ = \{XZW, Y\}$$

$$Y^+ = \{XZW, Y\}$$

XZW^+ & Y are C.K.

Q.4) $R(XY ZW)$ and, $FD = \{X \rightarrow Y, Y \rightarrow Z, Z \rightarrow X\}$

sol.



$$W^+ = \{W\}$$

$$WX^+ = \{W, X, Y, Z\}$$

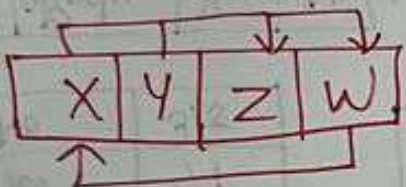
$$WY^+ = \{W, Y, Z, X\}$$

$$WZ^+ = \{W, Z, X, Y\}$$

WX, WY, WZ are C.K.

Q.5) $R(XY ZW)$, $FD = \{XY \rightarrow ZW, W \rightarrow X\}$

sol.



$$Y^+ = \{Y\}$$

$$\checkmark YX^+ = \{Y, X, Z, W\}$$

YX & YW are C.K.

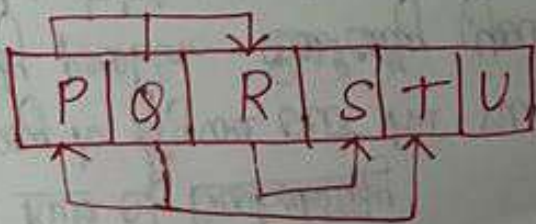
$$YZ^+ = \{Y, Z\}$$

$$\checkmark YW^+ = \{Y, W, X, Z\}$$

Q.6) $R(P, Q, R, S, T, U)$,

$FD = \{PQ \rightarrow R, R \rightarrow S, Q \rightarrow PT\}$

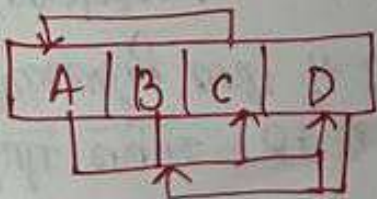
sol.



$$QU^+ = \{Q, U, P, T, R, S\}$$

only 1 C.K.

Q.7) $R(A, B, C, D)$, $FD = \{AB \rightarrow CD, C \rightarrow A, D \rightarrow B\}$



$$AB^+ = \{A, B, C, D\} \checkmark$$

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

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

{Total 4 C.K.}

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

$$AD^+ = \{A, D, B, C\} \checkmark$$

$$BC^+ = \{B, C, A, D\} \checkmark$$

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

$$CD^+ = \{C, D, A, B\} \checkmark$$