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## DBMS Assignment - 2

Q1. Find the highest normal form.

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

A      B      C      D

$A^+ = \{A, B, C, D\} \rightarrow$  S.K & C.K

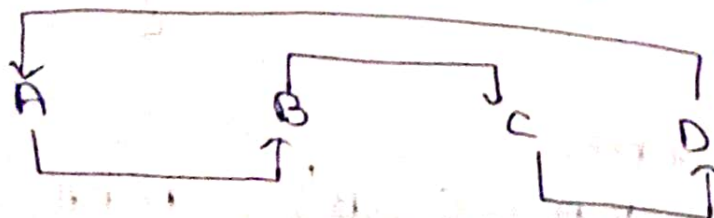
$\{A\}$  is PA

$\{B, C, D\}$  is NPA.

BCNF	$AB \rightarrow C$	$C \rightarrow D$	$A \rightarrow B$
BCNF	<del>✓</del>	X	✓
3NF	X	X	✓
2NF	✓	✓	✓

$\therefore$  It is in 2NF.

2.  $R(A, B, C, D)$ ,  $FD = \{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow A\}$



$$A^+ = \{A B C D\} - S.K \in C.K$$

$$B^+ = \{B C D A\} - S.K \in C.K$$

$$C^+ = \{C D A B\} - S.K \in C.K$$

$$D^+ = \{D A B C\} - S.K \in C.K$$

$\{A B C D\}$  are P.A

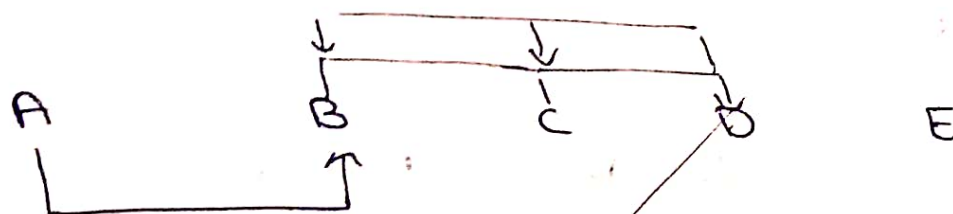
NO NPA.

$$BCNF: \quad A \rightarrow B \quad B \rightarrow C \quad C \rightarrow D \quad D \rightarrow A$$

$\downarrow \quad \quad \downarrow \quad \quad \downarrow \quad \quad \downarrow$

$\therefore$  It is BCNF.

3.  $R(AB CDE)$   $FD = \{A \rightarrow B, BC \rightarrow D, D \rightarrow BC, DE \rightarrow \emptyset\}$



$$A^+ = \{A B\} \times$$

$$BC^+ = \{B C D\} \times$$

$$D^+ = \{B C D\} \times$$

$$ABE^+ = \{A B E\} \times$$

$$ACE^+ = \{A C E B D\} S.K \in C.K$$

$$ADE^+ = \{A D E B C\} \rightarrow S.K \in C.K$$

$$AE^+ = \{A E B\} \times$$

By default it is 1NF.

$\therefore \{A C E D\}$  are P.A &  $\{B\}$  is N.P.A.

$R(A B C D), FD = \{A \rightarrow E, B \rightarrow E, A \rightarrow F\}$   
 It cannot be determined

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



$A^+ = \{A\}$

$B^+ = \{B\}$

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

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

$AB^+ = \{AB, CD\} \rightarrow S, K \in C, K$

$BC^+ = \{B, C, A, D\} \rightarrow S, K \in C, K$

$CD^+ = \{C, D, A, B\} \rightarrow S, K \in C, K$

$AD^+ = \{A, B, D, C\} \rightarrow S, K \in C, K$

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

$\{AB\}, \{CD\}, \{B, D\}$  are PA.

NO NPA.

$AB \rightarrow CD$

$C \rightarrow A$

$D \rightarrow B$

BCNF

✓

✗

✗

3NF

✓

✓

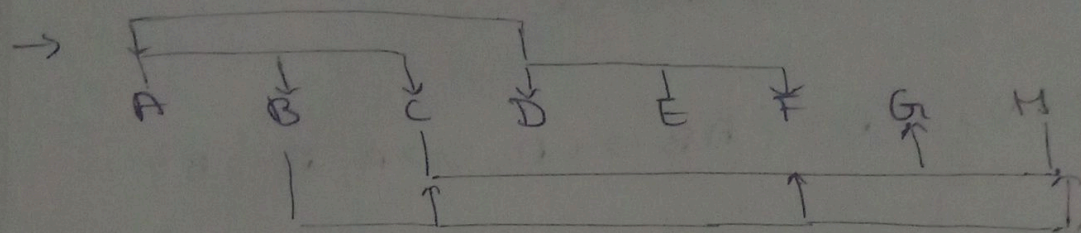
✓

$\therefore$  It is 3NF.



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

$FD = \{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$



$$D^+ = \{D\} \times$$

$$CH^+ = \{CHG\} \times$$

$$A^+ = \{A B C F H E G\} \times$$

$$B^+ = \{B C F H E G A\} \times$$

$$E^+ = \{E A B C F H G\} \times$$

$$F^+ = \{F E G A B C H\} \times$$

3.

$$AD^+ = \{A D B C F H E G\} \rightarrow S.K \notin C.K$$

$$DB^+ = \{D B C F H E G A\} \rightarrow S.K \in C.K$$

$$DE^+ = \{D E A B C F H G\} \rightarrow S.K \in C.K$$

$$DF^+ = \{D F E G A B C H\} \rightarrow S.K \in C.K$$

$\{A, D\}$   $\{D, B\}$   $\{D, E\}$   $\{D, F\}$  are P.A

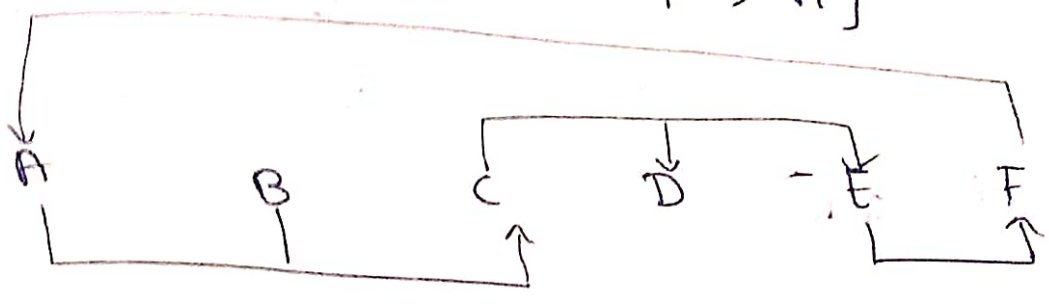
$\{C, G, H\}$  are N.P.A.

	$CH \rightarrow G$	$A \rightarrow BC$	$B \rightarrow CFH$	$E \rightarrow A$	$F \rightarrow EG$
BCNF	x	x	x	x	x
3NF	x	✓	✓	✓	✓
2NF	✓	x	x	x	x

∴ It is 1NF<sub>4</sub>



① (A B C D E F)  $FD = \{ AB \rightarrow C, C \rightarrow DE, E \rightarrow F, F \rightarrow A \}$   
 SG}



$$B^+ = \{B\}_x \quad A^+ = \{A\}_x \quad D^+ = \{D\}_x$$

$$AB^+ = \{AB C D E F\} \text{ s.t. } k \in C, k$$

$$C^+ = \{C D E F A\}_x$$

$$E^+ = \{E F A\}_x$$

$$F^+ = \{F A\}_x$$

$$AC^+ = \{A C D E F\}_x$$

$$AD^+ = \{A D\}_x$$

$$AE^+ = \{A E F\}_x$$

$$AF^+ = \{A F\}_x$$

$$BC^+ = \{B C D E F A\} \text{ s.t. } k \in C, k$$

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

$$BE^+ = \{B E F A\}_x$$

$$BF^+ = \{B F A\}_x$$

$$DE^+ = \{D E F A\}_x$$

$$DF^+ = \{D F A\}_x$$

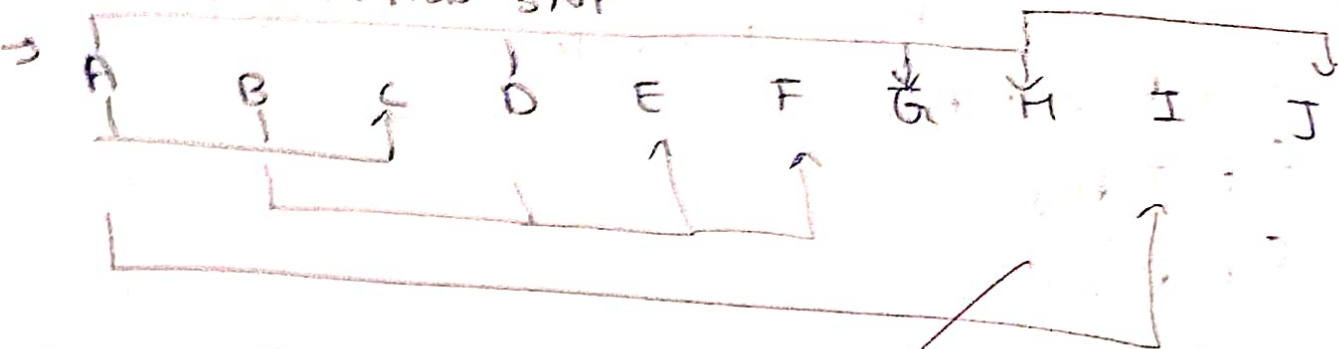
$E F^+ = \{E F A\}_x$   
 $\{AB\}, \{BC\}$  are P.A  
 $\{DEF\}$  are Not P.A

	$AB \rightarrow C$	$C \rightarrow DE$	$E \rightarrow F$	$F \rightarrow A$
BCNF	✓	✗	✗	✗
3NF	✓	✓	✗	✓
2NF	✓	✓	✗	✗

By default it is 1NF.

8.  $R(A, B, C, D, E, F, G, H, I, J)$

FD:  $\{AB \rightarrow C, AD \rightarrow GH, BD \rightarrow EF, A \rightarrow I, H \rightarrow J\}$   
Decompose it into 3NF



$ABD^+ \rightarrow \{A, B, C, D, G, H, I, J, E, F, I\} \rightarrow S, K, G, K$

$A^+ \rightarrow \{A, I\}$  ✗

$B^+ \rightarrow \{B, I\}$  ✗

$D^+ \rightarrow \{D, I\}$  ✗

$\{A, B, D\}$  is PA

$\{C, E, F, G, H, I, J\}$  is NPA

$H \rightarrow J \rightarrow$  ANPA

So it is not a 3NF