

Course Name: **A Level (1st Sem)**
Topic: **FD – Exercise Practices on Closure of Attribute Sets (Part 7)**

Subject : **Introduction to DBMS**
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Exercise Practices - Closure of Attribute Sets

Q 1. Suppose, a relational schema R (A, B, C, D, E) and set of functional dependencies:

$$F \{ A \rightarrow BC, \\ CD \rightarrow E, \\ B \rightarrow D, \\ E \rightarrow A \}$$

Compute CD^+ , E^+ (closure of attribute set CD, attribute E respectively).

Solution 1:

$$CD^+ = CD$$

Initially result is CD.

$$CDE$$

Because of functional dependency $CD \rightarrow E$, result includes E

$$ACDE$$

Because of functional dependency $E \rightarrow A$, result includes A

$$ABCDE$$

Because of functional dependency $A \rightarrow BC$, result includes B
(C is already present in the result).

$$\text{Therefore } CD^+ = (ABCDE)$$

$$E^+ = E$$

Initially result is E.

$$AE$$

Because of functional dependency $E \rightarrow A$

$$ABCE$$

Because of functional dependency $A \rightarrow BC$

$$ABCDE$$

Because of functional dependency $B \rightarrow D$

$$\text{Therefore } E^+ = (ABCDE)$$

Q 2. Suppose, a relational schema R (A, B, C, D, E, F) and set of functional dependencies:

$$F \{ \begin{array}{l} A B \rightarrow C, \\ BC \rightarrow AD, \\ D \rightarrow E, \\ CF \rightarrow B \end{array} \}$$

Compute BCF^+ , CD^+ , D^+ .

Solution 2:

$$BCF^+ = B C F$$

$$A B C D F$$

$$A B C D E F$$

Initially result is BCF.

Because of functional dependency $BC \rightarrow AD$, result includes AD.

Because of functional dependency $D \rightarrow E$, result includes E.

$$\text{Therefore } BCF^+ = (A B C D E)$$

$$CD^+ = C D$$

$$C D E$$

Initially result is CD.

Because of functional dependency $D \rightarrow E$, result includes E.

$$\text{Therefore } CD^+ = (C D E)$$

$$D^+ = D$$

$$D E$$

Initially result is D.

Because of functional dependency $D \rightarrow E$, result includes E.

$$\text{Therefore } D^+ = (D E)$$

Q 3. Suppose, a relational schema R (A, B, C, D, E, F, G, H) and set of functional dependencies:

$F \{ A \rightarrow BC,$
 $E \rightarrow C,$
 $AH \rightarrow D,$
 $CD \rightarrow E,$
 $D \rightarrow AEH,$
 $DH \rightarrow BC \}$

Compute AE^+ . Is $BCD \rightarrow H$ valid or not?

Solution 3:

$AE^+ = A E$

$A C E$

$A B C E$

Initially result is AE.

Because of functional dependency $E \rightarrow C$, result includes C.

Because of functional dependency $A \rightarrow BC$, result includes B (C is already present in the result).

To prove $BCD \rightarrow H$ holds in above relation, $(BCD)^+$ must include the attribute H, so

$BCD^+ = B C D$

$B C D E$

$A B C D E H$

Initially result is BCD.

Because of functional dependency $CD \rightarrow E$, result includes E.

Because of functional dependency $D \rightarrow AEH$, result includes EH (A is already present in the result).

Since $BCD^+ = (A B C D E H)$, it proves that $BCD \rightarrow H$ is valid in above relation.

Exercise:

1. Understand all above exercises clearly and then try to solve all the exercises without referring solutions given above.

