

CS & DA

Database Management System

DPP: 2

Relational model and Normal forms

Q1 Consider the set of functional dependencies for a relation

$R(D, N, C, S)$

$\{D \rightarrow N, D \rightarrow C, D \rightarrow S, C \rightarrow S\}$

Then choose the correct statement regarding the above set.

- (A) $\{D\}$ is the superkey for the relation.
- (B) $\{DN\}$ is the candidate key for the relation.
- (C) $\{DC\}$ is the candidate key for the relation.
- (D) $\{CN\}$ is the superkey for the relation.

Q2 Consider the given FD set for relation

$R(X, Y, Z, W, U, V)$

$\{X \rightarrow Y, YZ \rightarrow W, U \rightarrow Z, W \rightarrow X\}$

Then the number of prime attributes for the relation are?

Q3 Consider the relation $R(P, Q, R, S, T)$ and the set of function dependencies $F = \{P \rightarrow Q, QR \rightarrow T, TS \rightarrow P\}$. Which of the following is not the candidate key of R ?

- (A) RST
- (B) PRS
- (C) QRS
- (D) PQR

Q4 Assume a relation $R(P, Q, R, S, T)$ with the set of functional dependencies $\{P \rightarrow Q, Q \rightarrow R, R \rightarrow Q$ and $Q \rightarrow T\}$. How many candidate keys are possible in R ?

Q5 Consider a schema with attributes A, B, C, D & E following set of functional dependencies are given,

$A \rightarrow B$

$A \rightarrow C$

$CD \rightarrow E$

$B \rightarrow D$

$E \rightarrow A$

Which of the following functional dependencies is implied by the above set?

(A) $CD \rightarrow AC$

(B) $BC \rightarrow CD$

(C) $AC \rightarrow BC$

(D) $BD \rightarrow CD$

Q6 Consider the following two sets of functional dependencies

$X = \{P \rightarrow Q, Q \rightarrow R, R \rightarrow P, P \rightarrow R, R \rightarrow Q, Q \rightarrow P\}$

$Y = \{P \rightarrow Q, Q \rightarrow R, R \rightarrow P\}$

Which of the following is true?

- (A) $X \subset Y$
- (B) $Y \subset X$
- (C) $X \equiv Y$
- (D) None of the above

Q7 Consider the relation schema $R(P, Q, R, S, T, U, V, W, X, Y)$ and the set of functional dependencies on R are:

$F = \{PQ \rightarrow R, Q \rightarrow TU, PS \rightarrow VW, V \rightarrow X, W \rightarrow Y\}$.

Which of the following can be the candidate key for R ?

- (A) PQT
- (B) PQS
- (C) PQSR
- (D) PQSVW

Q8 Consider the following FD sets:

$S_1 = \{P \rightarrow R, PR \rightarrow S, T \rightarrow PS, T \rightarrow U\}$

$S_2 = \{P \rightarrow S, QR \rightarrow PS, R \rightarrow Q, T \rightarrow P, T \rightarrow S, T \rightarrow U\}$

$S_3 = \{P \rightarrow S, R \rightarrow P, R \rightarrow Q, T \rightarrow PU\}$

Which of the following sets is equivalent?

- (A) $S_1 \equiv S_2$
- (B) $S_2 \equiv S_3$
- (C) $S_1 \equiv S_3$
- (D) $S_1 \equiv S_2 \equiv S_3$

Q9 Assume the relation R that has eight attributes ABCDEFGH.

Let $A = \{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$ is a set of functional dependencies (FD). How many candidates keys does the relation R have?



Q10 Assume the relation schema $R(P, Q, R, S, T, U, V, W, X, Y)$ and the set of functional dependencies on R :

$F = \{PQ \rightarrow R, Q \rightarrow UV, PT \rightarrow WX, W \rightarrow Y, X \rightarrow S\}$.

Which of the following can be candidate key for R ?

- (A) PQU (B) PQT
(C) PQTR (D) PQTWX

Answer Key

- Q1 (A)
Q2 5
Q3 (D)
Q4 1
Q5 (A, B, C)

- Q6 (C)
Q7 (B)
Q8 (B)
Q9 4
Q10 (B)

Hints & Solutions

Q1 **Text Solution:**

D is the only candidate key and every candidate key is also a super key.

Q2 **Text Solution:**

The candidate keys are UVX, UVW , and UVY .
Prime attributes = $\{U, V, W, X, Y\}$

Q3 **Text Solution:**

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

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

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

$PQR^+ = \{P, Q, R, T\}$

Hence, PQR is not a candidate key.

Q4 **Text Solution:**

$\{PS\}$ is the only candidate for given FD's.

Q5 **Text Solution:**

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

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

$AC^+ = \{C, D, E, A, B\}$

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

Q6 **Text Solution:**

All FD's of Y belong to X and all FD's of X belong to Y . So, both are equivalent.

Q7 **Text Solution:**

$PQS^+ = \{P, Q, R, S, T, U, V, W, X, Y\}$

Although $PQSR$ and $PQSVW$ also derives all the attributes but they are not minimal. Hence, PQS is the candidate key.

Q8 **Text Solution:**

$S_2 = \{P \rightarrow S, QR \rightarrow PS, R \rightarrow Q, T \rightarrow P, T \rightarrow S, T \rightarrow U\}$

$S_3 = \{P \rightarrow S, R \rightarrow P, R \rightarrow Q, T \rightarrow PU\}$

$S_2 \subseteq S_3$

$S_3 \subseteq S_2$

Hence, $S_2 \equiv S_3$.

Q9 **Text Solution:**

Candidate keys = $\{DA, ED, FD, BD\} = 4$

Q10 **Text Solution:**

PQT is the candidate key for the given relation.



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