

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?



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- 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 derive 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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