GATE

CS & IT

Database Management System

Relational model and Normal forms

DPP: 2

Q1 Consider the set of functional dependencies for a relation
R (D, N, C, S)
{D → N, D → C, D → S, C → 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 → Y, YZ → W, U → Z, W → 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→Q, QR→T, TS→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→Q, Q→R, R→Q and Q→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→B
A→C
CD→E
B→D
E→A
Which of the following functional dependencies is implied by the above set?
(A) CD → AC
(B) BC → CD
(C) AC → BC
(D) BD → CD

Q6 Consider the following two sets of functional dependencies
X = {P → Q, Q → R, R → P, P → R, R → Q, Q → P}
Y = {P → Q, Q → R, R → 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 → R, Q → TU, PS → VW, V → X, W → 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 → R, PR → S, T → PS, T → U}
S_2 = {P → S, QR → PS, R → Q, T → P, T → S, T → U}
S_3 = {P → S, R → P, R → Q, T → 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

GATE

ABCDEFGH.
Let A = {CH→G, A→BC, B→CFH, E→A, F→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→R, Q→UV, PT→WX, W→Y, X→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.

Q8 Text Solution:
S_2 = {P → S, QR → PS, R → Q, T → P, T → S, T → U}
S_3 = {P → S, R → P, R → Q, T → PU}
S2 ⊆ S3
S3 ⊆ S2
Hence, S2 ≡ S3.

Q9 Text Solution:
Candidate keys = {DA, ED, FD, BD} = 4

Q10 Text Solution:
PQT is the candidate key for the given relation.