GATE

CS & DA

Database Management System

DPP: 1

Relational model and Normal forms

Q1 Consider the student relation shown below with schema stud (Sname, Sage, Smail, Smarks),

Stud

Sname	Sage	Smail	Smarks
Rohit	28	R@pw.live	68
Kanika	25	K@pw.live	75
Pankaj	25	K@pw.live	75
Rohit	28	R@pw.live	88
Anjali	26	A@pw.live	75

For the above given instance how many set of attributes of size two can determine each row uniquely?

Q2 Consider a relation schema R(A, B, C, D, E, F, H) with the given functional dependency set:
{A → BC, C → AD, DE → F, C → F}
The attribute closure that contains all the attributes of the relation R is?
(A) AE+
(B) CE+
(C) AEH+
(D) All of the above

Q3 Consider the following set of FD's:
{V → W, W → XZ, X → YZ} for the relation R(V, W, X, Y, Z)
How many elements are present in the attribute closure of YZ?
(A) 0 (B) 1
(C) 2 (D) 3

Q4 For the given FD set: {P → QT, Q → SU, V → U} of a relation R(P, Q, T, S, U, V). Find the set of attributes that is Super key but not a Candidate key?
(A) PTQ (B) PV
(C) PQV (D) QV

Q5 Choose the correct statement from the following.
(A) The cardinality is defined as the number of attributes in a relation.
(B) Degree of the relation is the number of tuples in the relation.
(C) Relation instance is the set of tuples of a relation at a particular instance of time.
(D) All of the above

Q6 Choose the correct statements from the following:
(A) There can be many primary keys for a relation.
(B) There can be many alternate keys for a relation.
(C) All the candidate keys are also super keys.
(D) All the super keys are also the candidate keys.

Q7 Consider the following statements:
S_1: A key in DBMS is an attribute (or a set of attributes) that helps in uniquely identifying each tuple (or row) in a relation (or table).
S_2: There should be only one candidate key in relation, which is chosen as the primary key.
(A) Only S_1 is true.
(B) Only S_2 is true.
(C) Both S_1 and S_2 are true.
(D) Neither S_1 nor S_2 is true.

Q8 Consider the following statements:
S_1: Primary key has no duplicate values it has only unique values.
S_2: Primary key is not necessarily formed using a single column of the table, more than one column of the table can also be used to form a primary key of the table.
(A) Only S_1 is true.
(B) Only S_2 is true.
(C) Both S_1 & S_2 are true.
(D) Neither S_1 nor S_2 are true.

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Q9 Assume a relation R (P, Q, R, S, T). If PR and RT are the only candidate keys of the relation R, then how many total super keys exist in relation R.

Q10 Assume a relation R (P, Q, R, S, T, U, V).
If PQ, RS, and TU are the only three candidate keys of relation R, then how many total super keys exist in relation R?

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Answer Key

Q1	1
Q2	(C)
Q3	(C)
Q4	(C)
Q5	(C)
Q6	(B, C)
Q7	(A)
Q8	(C)
Q9	12
Q10	74

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Hints & Solutions

Q1 Text Solution:

We can clearly observe that none of the attribute can determine a tuple uniquely (Single attribute), if we check for 2-attribute set then only (Sname, Smarks)
can determine a row uniquely for the instance.
So, the answer is 1.

Q2 Text Solution:

The attribute closure AE+ = {A, B, C, D, E, F}.
The attribute closure CE+ = {C, E, A, B, D, F}.
But the attribute H is missing from the above closures.
The attribute closure AEH+ = {A, B, C, D, E, F, H}.
Therefore, C is the correct answer.

Q3 Text Solution:

The attribute closure of YZ+ = {Y, Z}, no other attribute can be determined by YZ.

Q4 Text Solution:

The key for the given FD set.
{P → QT, Q → SU, V → U}
PV+ = {P, Q, T, V, U, S}
PVQ+ = {P, Q, T, V, U, S}
PTQ+ = {P, T, Q}
QV+ = {Q, V, S, U}
we have PV^+ as the candidate key and also it is the super key. PVQ^+
is the super key but it is not a Candidate Key (not minimal set)

Q5 Text Solution:

- Cardinality is defined as the number of tuples in a relation.
- Degree is defined as the number of attributes in a relation.
- Relation instance is the set of tuples of a relation at a particular instance of time.

Q6 Text Solution:

I. There exists exactly at most one primary key for any relational table while there can be multiple alternate keys for a relation.
II. All the candidate keys are super keys, but it is not compulsory that all super key are candidate keys.
NOTE: A candidate key is minimal set of attributes that determine relational table uniquely. Also, every candidate key is a Super key but every Super key need not be Candidate.

Q7 Text Solution:

S_1: True: A key in DBMS is an attribute (or) a set of attributes that help to uniquely identify a tuple (or row) in a relation (or table).
S_2: False: There can be more than one candidate key in relation out of which one can be chosen as primary key.

Q8 Text Solution:

- Primary key has no duplicate values it has only unique values. Hence S_1 is true.
- Primary key is not necessarily to be a single column more than one column can also be a primary key for the table. Hence S_2 is true.

Q9 Text Solution:

PR RT Common

- $2^{5-2} + 2^{5-2} - 2^{5-3}$
- $2^3 + 2^3 - 2^2$
- $8 + 8 - 4 \Rightarrow 16 - 4 = 12$

Q10 Text Solution:

Common between two keys

PQ RS TU

$$2^{7-2} + 2^{7-2} + 2^{7-2} + - \left(2^{7-2} + 2^{7-4} + 2^{7-4}\right)$$

Common between all three keys

$$+ \quad 2^{7-6}$$