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SQL & RDBMS PYQ Discussion

Special class

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GATE-2022

Consider the relational database with the following four schemas and their respective instances.

- Student(sNo, sName, dNo) Dept(dNo, dName)
- Course(cNo, cName, dNo) Register(sNo, cNo)

	Students	
sNo	sName	dNo
S01	James	D01
S02	Rocky	D01
S03	Jackson	D02
S04	Jane	D01
S05	Milli	D02

	Dept
dNo	dName
D01	CSE
D02	EEE

	Course	
cNo	cName	dNo
C11	DS	D01
C12	OS	D01
C21	DE	D02
C22	PT	D02
C23	CV	D03

	Register
sNo	cNo
S01	C11
S01	C12
S02	C11
S03	C21
S03	C22
S03	C23
S04	C11
S04	C12
S05	C11
S05	C21

```
SELECT * FROM Student AS S WHERE NOT EXIST
  (SELECT cNo FROM Course WHERE dNo = "D01"
     EXCEPT
   SELECT cNo FROM Register WHERE sNo = S.sNo)
```

The number of rows returned by the above SQL query is _____

Result

S01 James D01

S04 James D01

Ans = 2

▲ 1 • Asked by Shreyas

Please help me with this doubt

Consider a database with three relation instances shown below. The primary keys for the Drivers and Cars relation are *did* and *cid* respectively and the records are stored in ascending order of these primary keys as given in the tables. No indexing is available in the database.

D: Drivers relation

did	dname	rating	age
22	Karthikeyan	7	25
29	Salman	1	33
31	Boris	8	55
32	Arnoldt	8	25
58	Schumacher	10	35
64	Sachin	7	35
71	Senna	10	16
74	Sachin	9	35
85	Rahul	3	25
95	Ralph	3	53

R: Reserves relation

did	Cid	day
22	101	10 – 10 – 06
22	102	10 – 10 – 06
22	103	08 – 10 – 06
22	104	07 – 10 – 06
31	102	10 – 11 – 16
31	103	06 – 11 – 16
31	104	12 – 11 – 16
64	101	05 – 09 – 06
64	102	08 – 09 – 06
74	103	08 – 09 – 06

C: Cars relation

Cid	Cname	colour
101	Renault	blue
102	Renault	red
103	Ferrari	green
104	Jaguar	red

```
select D.dname
from Drivers D
where D.did in (
        select R.did
        from Cars C, Reserves R
        where R.cid = C.cid and C.colour = 'red'
        intersect
        select R.did
        from Cars C, Reserves R
        where R.cid  = C.cid and C.colour = 'green'
        )
```

Let n_1 be the number of comparisons performed when the above SQL query is optimally executed. If linear search is used to locate a tuple in a relation using primary key, then n_1 lies in the range:

22, 31, 64

22, 71, 74

2 rows

4 + 10 + 7

2 + 5

28 + 9 = 37

+ 4

41

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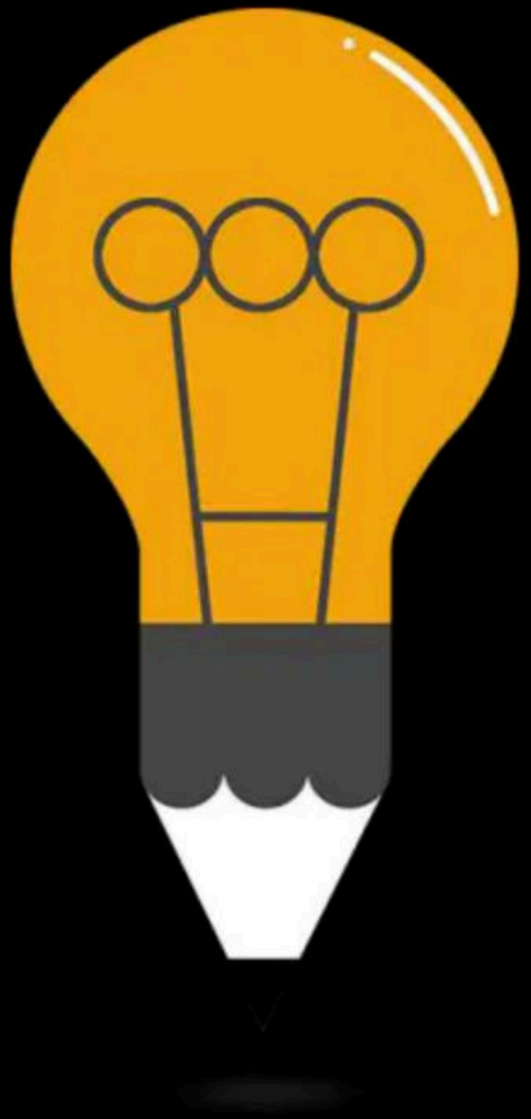

PYQ:

Relational DB

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Question GATE-1990

Choose the correct alternatives (More than one may be correct).

Indicate which of the following statements are true:

A relational database which is in 3NF may still have undesirable data redundancy because there may exist:

A. Transitive functional dependencies
B. Non-trivial functional dependencies involving prime attributes on the right-side.
C. Non-trivial functional dependencies involving prime attributes only on the left-side.
D. Non-trivial functional dependencies involving only prime attributes.

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Question GATE-1999

Consider the schema $R = (S, T, U, V)$ and the dependencies $S \rightarrow T, T \rightarrow U, U \rightarrow V$ and $V \rightarrow S$. Let $R = (R1 \text{ and } R2)$ be a decomposition such that $R1 \cap R2 \neq \phi$. The decomposition is

A. not in $2NF$
B. in $2NF$ but not $3NF$
C. in $3NF$ but not in $2NF$
D. in both $2NF$ and $3NF$

$S \rightarrow T$
$T \rightarrow U$
$U \rightarrow V$
$V \rightarrow S$

$R1(S, T)$

$R1(S, U, V)$

$S \rightarrow T, T \rightarrow S$

$U \rightarrow V,$
$V \rightarrow S, S \rightarrow U$

Question GATE-1999

Let $R = (A, B, C, D, E, F)$ be a relation scheme with the following dependencies $C \rightarrow F, E \rightarrow A, EC \rightarrow D, A \rightarrow B$. Which one of the following is a key for R?

A. CD B. EC C. AE D. AC

$C \rightarrow F$

$E \rightarrow A$

$EC \rightarrow D$

$A \rightarrow B$

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

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Question GATE-2000

Given the following relation instance.

X	Y	Z
1	4	2
1	5	3
1	6	3
3	2	2

Which of the following functional dependencies are satisfied by the instance?

A. $XY \rightarrow Z$ and $Z \rightarrow Y$

B. $YZ \rightarrow X$ and $Y \rightarrow Z$

C. $YZ \rightarrow X$ and $X \rightarrow Z$

D. $XZ \rightarrow Y$ and $Y \rightarrow X$

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Question GATE-2001

Consider a schema $R(A, B, C, D)$ and functional dependencies $A \rightarrow B$ and $C \rightarrow D$. Then the decomposition of R into $R_1(A, B)$ and $R_2(C, D)$ is

A. dependency preserving and lossless join
B. lossless join but not dependency preserving
C. dependency preserving but not lossless join
D. not dependency preserving and not lossless join

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Question GATE-2001

$R(A, B, C, D)$ is a relation. Which of the following does not have a lossless join, dependency preserving $BCNF$ decomposition?

A. $A \rightarrow B, B \rightarrow CD$
B. $A \rightarrow B, B \rightarrow C, C \rightarrow D$
C. $AB \rightarrow C, C \rightarrow AD$
D. $A \rightarrow BCD$

(A) $A \rightarrow B$, $B \rightarrow CD$

key $\Rightarrow$ A

BNF decom. $\Rightarrow$ $R_1(A, B)$ $A \rightarrow B$; $R_2(B, C, D)$ $B \rightarrow CD$ } also in BCNF

(B) (C) $AB \rightarrow C$, $C \rightarrow AD$

keys $\Rightarrow$ AB, CB

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Question GATE-2002

Relation R with an associated set of functional dependencies, F, is decomposed into BCNF. The redundancy (arising out of functional dependencies) in the resulting set of relations is

A. Zero
B. More than zero but less than that of an equivalent $3NF$ decomposition
C. Proportional to the size of F^+
D. Indeterminate

FD^s ⇒ zero

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Question GATE-2002

From the following instance of a relation schema $R(A, B, C)$, we can conclude that:

A	B	C
1	1	1
1	1	0
2	3	2
2	3	2

A. A functionally determines B and B functionally determines C
B. A functionally determines B and B does not functionally determine C
C. B does not functionally determine C
D. A does not functionally determine B and B does not functionally determine C

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Question GATE-2002

Relation R is decomposed using a set of functional dependencies, F, and relation S is decomposed using another set of functional dependencies, G. One decomposition is definitely BCNF, the other is definitely $3NF$, but it is not known which is which. To make a guaranteed identification, which one of the following tests should be used on the decompositions? (Assume that the closures of F and G are available).

A. Dependency-preservation
B. Lossless-join
C. BCNF definition
D. $3NF$ definition

$R \Rightarrow F$ $S \Rightarrow G$

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Question GATE-2004

The relation scheme Student Performance (name, courseNo, rollNo, grade) has the following functional dependencies:

n c r g

- name, courseNo, → grade
- rollNo, courseNo → grade
- name → rollNo
- rollNo → name

The highest normal form of this relation scheme is

A. 2NF B. 3NF C. BCNF D. 4NF

nc → g

rc → g

n → r

r → n

$nc^+ = \{n, c, g, r\}$

$rc^+ = \{r, c, n, g\}$

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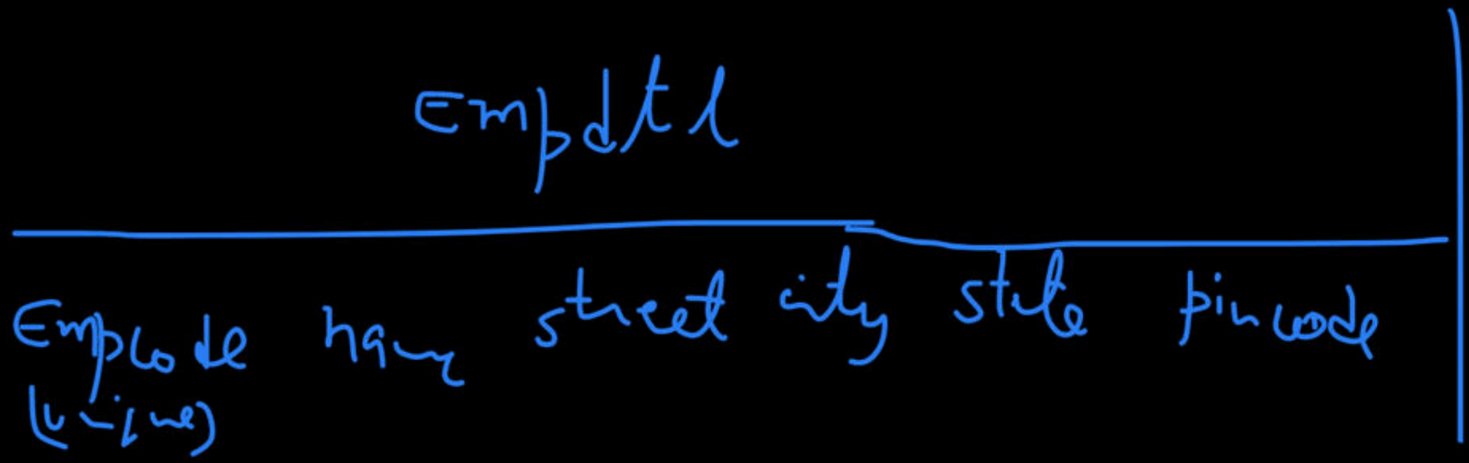
Question GATE-2004

A relation Empdtl is defined with attributes empcode (unique), name, street, city, state and pincode. For any pincode, there is only one city and state. Also, for any given street, city and state, there is just one pincode. In normalization terms, Empdtl is a relation in

A. $1NF$ only
B. $2NF$ and hence also in $1NF$
C. $3NF$ and hence also in $2NF$ and $1NF$
D. BCNF and hence also in $3NF$, $2NF$ and $1NF$



pincode → city, state
street, city, state → pincode

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Question GATE-2005

In a schema with attributes A, B, C, D and 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 NOT implied by the above set?

A. $CD \rightarrow AC$ B. $BD \rightarrow CD$ C. $BC \rightarrow CD$ D. $AC \rightarrow BC$

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Question GATE-2005

Which one of the following statements about normal forms is FALSE?

A. BCNF is stricter than $3NF$

B. Lossless, dependency-preserving decomposition into $3NF$ is always possible

C. Lossless, dependency-preserving decomposition into BCNF is always possible

D. Any relation with two attributes is in BCNF

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Question GATE-2005

Consider a relation scheme $R = (A, B, C, D, E, H)$ on which the following functional dependencies hold: $\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$. What are the candidate keys R?

A. AE, BE B. AE, BE, DE C. AEH, BEH, BCH D. AEH, BEH, DEH

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Question GATE-2005

A table has fields $Fl, F2, F3, F4, F5$ with the following functional dependencies
$F1 \rightarrow F3 \quad F2 \rightarrow F4 \quad (F1.F2) \rightarrow F5$
In terms of Normalization, this table is in

A. $1NF$ B. $2NF$ C. $3NF$ D. None of these

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Question GATE-2005

Let r be a relation instance with schema R = (A, B, C, D). We define $r_1 = \pi_{A,B,C}(R)$ and $r_2 = \pi_{A,D}(r)$. Let $s = r_1 * r_2$ where $*$ denotes natural join. Given that the decomposition of r into r_1 and r_2 is lossy, which one of the following is TRUE?

A. $s \subset r$

B. $r \cup s = r$

C. $r \subset s$

D. $r * s = s$

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Question GATE-2006

The following functional dependencies are given:

$$AB \rightarrow CD, AF \rightarrow D, DE \rightarrow F, C \rightarrow G, F \rightarrow E, G \rightarrow A$$

Which one of the following options is false?

A. $\{CF\}^* = \{ACDEFG\}$

B. $\{BG\}^* = \{ABCDG\}$

C. $\{AF\}^* = \{ACDEFG\}$

D. $\{AB\}^* = \{ABCDG\}$

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Question GATE-2006

Consider a relation R with five attributes V, W, X, Y, and Z. The following functional dependencies hold:

$VY \rightarrow W$, $WX \rightarrow Z$, and $ZY \rightarrow V$.

Which of the following is a candidate key for R?

A. VXZ B. VXY C. VWXY D. VWXYZ

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Question GATE-2007

Which one of the following statements is FALSE?

A. Any relation with two attributes is in BCNF
B. A relation in which every key has only one attribute is in $2NF$
C. A prime attribute can be transitively dependent on a key in a $3NF$ relation
D. A prime attribute can be transitively dependent on a key in a BCNF relation

Question GATE-2008

Consider the following relational schemes for a library database:

```
Book (Title, Author, Catalog_no, Publisher, Year, Price)
Collection(Title, Author, Catalog_no)
```

with the following functional dependencies:

I. Title Author $\rightarrow$ Catalog_no
II. Catalog_no $\rightarrow$ Title Author Publisher Year
III. Publisher Title Year $\rightarrow$ Price

Assume { Author, Title } is the key for both schemes. Which of the following statements is true?

A. Both Book and Collection are in BCNF
B. Both Book and Collection are in $3NF$ only
C. Book is in $2NF$ and Collection in $3NF$
D. Both Book and Collection are in $2NF$ only

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Question GATE-2008

Let $R(A, B, C, D)$ be a relational schema with the following functional dependencies : $A \rightarrow B$, $B \rightarrow C$, $C \rightarrow D$ and $D \rightarrow B$. The decomposition of R into (A, B), (B, C), (B, D)

A. gives a lossless join, and is dependency preserving
B. gives a lossless join, but is not dependency preserving
C. does not give a lossless join, but is dependency preserving
D. does not give a lossless join and is not dependency preserving

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Question GATE-2008

Let $R(A, B, C, D, E, P, G)$ be a relational schema in which the following functional dependencies are known to hold: $AB \rightarrow CD, DE \rightarrow P, C \rightarrow E, P \rightarrow C$ and $B \rightarrow G$. The relational schema R is

A. in BCNF
B. in $3NF$, but not in BCNF
C. in $2NF$, but not in $3NF$
D. not in $2NF$

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Question GATE-2009

Consider the following relational schema:

Suppliers(sid:integer, sname:string, city:string, street:string)

Parts(pid:integer, pname:string, color:string)

Catalog(sid:integer, pid:integer, cost:real)

Assume that, in the suppliers relation above, each supplier and each street within a city has unique name, and (sname, city) forms a candidate key. No other functional dependencies are implied other than those implied by primary and candidate keys. Which one of the following is TRUE about the above schema?

A. The schema is in BCNF
B. The schema is in $3NF$ but not in BCNF
C. The schema is in $2NF$ but not in $3NF$
D. The schema is not in $2NF$

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Question GATE-2010

The following functional dependencies hold for relations $R(A, B, C)$ and $S(B, D, E)$.

- $B \rightarrow A$
- $A \rightarrow C$

The relation R contains 200 tuples and the relation S contains 100 tuples. What is the maximum number of tuples possible in the natural join $R \bowtie S$?

A. 100 B. 200 C. 300 D. 2000

Question GATE-2011

Consider a relational table with a single record for each registered student with the following attributes:

1. Registration_Num: Unique registration number for each registered student
2. UID: Unique identity number, unique at the national level for each citizen
3. BankAccount_Num: Unique account number at the bank. A student can have multiple accounts or joint accounts. This attribute stores the primary account number.
4. Name: Name of the student
5. Hostel_Room: Room number of the hostel

Which of the following options is **INCORRECT**?

A. BankAccount_Num is a candidate key
B. Registration_Num can be a primary key
C. UID is a candidate key if all students are from the same country
D. If S is a super key such that $S \cap$ UID is NULL then $S \cup$ UID is also a superkey

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Question GATE-2012

Which of the following is **TRUE**?

A. Every relation in 3NF is also in BCNF
B. A relation R is in 3NF if every non-prime attribute of R is fully functionally dependent on every key of R
C. Every relation in BCNF is also in 3NF
D. No relation can be in both BCNF and 3NF

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Question GATE-2013

Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F= $\{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$ is a set of functional dependencies (FDs) so that F^+ is exactly the set of FDs that hold for R.

How many candidate keys does the relation R have?

A. 3 B. 4 C. 5 D. 6

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Question GATE-2013

Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. $F = \{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$ is a set of functional dependencies (FDs) so that F^+ is exactly the set of FDs that hold for R.

The relation R is

A. in $1NF$, but not in $2NF$.
B. in $2NF$, but not in $3NF$.
C. in $3NF$, but not in BCNF.
D. in BCNF.

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Question GATE-2014

Consider the relation scheme $R = (E, F, G, H, I, J, K, L, M, N)$ and the set of functional dependencies

$$\{\{E, F\} \rightarrow \{G\}, \{F\} \rightarrow \{I, J\}, \{E, H\} \rightarrow \{K, L\}, \{K\} \rightarrow \{M\}, \{L\} \rightarrow \{N\}\}$$

on R. What is the key for R?

A. $\{E, F\}$ B. $\{E, F, H\}$ C. $\{E, F, H, K, L\}$ D. $\{E\}$

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Question GATE-2014

The maximum number of superkeys for the relation schema $R(E, F, G, H)$ with E as the key is _____.

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Question GATE-2014

Given an instance of the STUDENTS relation as shown as below

StudentID	StudentName	StudentEmail	StudentAge	CPI
2345	Shankar	shankar@math	X	9.4
1287	Swati	swati@ee	19	9.5
7853	Shankar	shankar@cse	19	9.4
9876	Swati	swati@mech	18	9.3
8765	Ganesh	ganesh@civil	19	8.7

For (StudentName, StudentAge) to be a key for this instance, the value X should NOT be equal to_____.

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Question GATE-2014

A *prime attribute* of a relation scheme R is an attribute that appears

A. in all candidate keys of R
B. in some candidate key of R
C. in a foreign key of R
D. only in the primary key of R

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Question GATE-2014

Given the following two statements:

S1: Every table with two single-valued attributes is in 1NF, 2NF, 3NF and BCNF.

S2: $AB \rightarrow C, D \rightarrow E, E \rightarrow C$ is a minimal cover for the set of functional dependencies $AB \rightarrow C, D \rightarrow E, AB \rightarrow E, E \rightarrow C$.

Which one of the following is **CORRECT**?

A. S1 is TRUE and S2 is FALSE.
B. Both S1 and S2 are TRUE.
C. S1 is FALSE and S2 is TRUE.
D. Both S1 and S2 are FALSE.

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Question GATE-2015

Consider two relations $R_1(A, B)$ with the tuples $(1, 5), (3, 7)$ and $R_2(A, C) = (1, 7), (4, 9)$. Assume that $R(A, B, C)$ is the full natural outer join of R_1 and R_2. Consider the following tuples of the form (A,B,C):

$a = (1, 5, null), b = (1, null, 7), c = (3, null, 9), d = (4, 7, null), e = (1, 5, 7), f = (3, 7, null), g = (4, null, 9)$

Which one of the following statements is correct?

A. R contains a, b, e, f, g but not c, d.
B. R contains all a, b, c, d, e, f, g.
C. R contains e, f, g but not a, b.
D. R contains e but not f, g.

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Question GATE-2015

Consider the relation $X(P, Q, R, S, T, U)$ with the following set of functional dependencies

$F = \{ \ \{P, R\} \rightarrow \{S, T\}, \ \ \{P, S, U\} \rightarrow \{Q, R\} \ \}$

Which of the following is the trivial functional dependency in F^+, where F^+ is closure to F?

A. $\{P, R\} \rightarrow \{S, T\}$

B. $\{P, R\} \rightarrow \{R, T\}$

C. $\{P, S\} \rightarrow \{S\}$

D. $\{P, S, U\} \rightarrow \{Q\}$

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Question GATE-2016

Which of the following is NOT a superkey in a relational schema with attributes V, W, X, Y, Z and primary key $V\ Y$?

A. $VXYZ$ B. $VWXZ$ C. $VWXY$ D. $VWXYZ$

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Question GATE-2016

A database of research articles in a journal uses the following schema.

(VOLUME, NUMBER, STARTPAGE, ENDPAGE, TITLE, YEAR, PRICE)

The primary key is '(VOLUME, NUMBER, STARTPAGE, ENDPAGE)

and the following functional dependencies exist in the schema.

$$\begin{aligned} (\text{VOLUME , NUMBER, STARTPAGE, ENDPAGE}) &\rightarrow \text{TITLE} \\ (\text{VOLUME, NUMBER}) &\rightarrow \text{YEAR} \\ (\text{VOLUME, NUMBER, STARTPAGE, ENDPAGE}) &\rightarrow \text{PRICE} \end{aligned}$$

The database is redesigned to use the following schemas

(VOLUME, NUMBER, STARTPAGE, ENDPAGE, TITLE, PRICE)(VOLUME, NUMBER, YEAR)

Which is the weakest normal form that the new database satisfies, but the old one does not?

A. $1NF$ B. $2NF$ C. $3NF$ D. BCNF

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Question GATE-2017

The following functional dependencies hold true for the relational schema $R\{V, W, X, Y, Z\}$:

$V \rightarrow W$
$VW \rightarrow X$
$Y \rightarrow VX$
$Y \rightarrow Z$

Which of the following is irreducible equivalent for this set of functional dependencies?

A. $V \rightarrow W$
$V \rightarrow X$
$Y \rightarrow V$
$Y \rightarrow Z$

B. $V \rightarrow W$
$W \rightarrow X$
$Y \rightarrow V$
$Y \rightarrow Z$

C. $V \rightarrow W$
$V \rightarrow X$
$Y \rightarrow V$
$Y \rightarrow X$
$Y \rightarrow Z$

D. $V \rightarrow W$
$W \rightarrow X$
$Y \rightarrow V$
$Y \rightarrow X$
$Y \rightarrow Z$

Question GATE-2018

Consider the following four relational schemas. For each schema , all non-trivial functional dependencies alre listed, The **bolded** attributes are the respective primary keys.

Schema I: Registration(**rollno**, courses)

Field 'courses' is a set-valued attribute containing the set of courses a student has registered for.

Non-trivial functional dependency

rollno → courses

Schema II: Registration (**rollno**, **coursid**, email)

Non-trivial functional dependencies:

rollno, courseid → email

email → rollno

Schema III: Registration (**rollno**, **courseid**, marks, grade)

Non-trivial functional dependencies:

rollno, courseid, → marks, grade

marks → grade

Schema IV: Registration (**rollno**, **courseid**, credit)

Non-trivial functional dependencies:

rollno, courseid → credit

courseid → credit

Which one of the relational schemas above is in 3NF but not in BCNF?

A. Schema I B. Schema II C. Schema III D. Schema IV

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Question GATE-2019

Let the set of functional dependencies $F = \{QR \rightarrow S,\ R \rightarrow P,\ S \rightarrow Q\}$ hold on a relation schema $X = (PQRS)$. X is not in BCNF. Suppose X is decomposed into two schemas Y and Z, where $Y = (PR)$ and $Z = (QRS)$.

Consider the two statements given below.

I. Both Y and Z are in BCNF
II. Decomposition of X into Y and Z is dependency preserving and lossless

Which of the above statements is/are correct?

A. Both I and II B. I only C. II only D. Neither I nor II

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Happy Learning.!