

Q.28 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 3 NF, but not in BCNF

(C) In 2 NF, but not in 3 NF

(D) Not in 2 NF

[GATE-2008]

Q.29 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) and (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.

[GATE-2008]

Q.31 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 2 NF.

(C) A prime attribute can be transitively dependent on a key in a 3 NF relation.

(D) A prime attribute can be transitively dependent on a key in a BCNF relation.

[GATE-2007]

Q.32 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) $\{AB\}^+ = \{ACDFG\}$

[GATE-2006]

Q.33 Consider a relation R with five attributes {VWXYZ}. 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

[GATE-2006]

Q.34 Consider the relations $r_1(P, Q, R)$ and $r_2(R, S, T)$ with primary keys P and R respectively. The relation r_1 contains 2000 tuples and r_2 contains 2500 tuples. The maximum size of the join $r_1 \bowtie r_2$ is

(A) 2000

(B) 2500

(C) 4500

(D) 5000

[GATE-2006]

Q.35 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) $AC \rightarrow BC \rightarrow AC^T = AC^B$

$CD^T = CDEAC$

$BD^T = BD^X$

$BC^T = BC^D$

[GATE-2005]

Q.36 Consider a relation schema R (ABCDEH) on which the following functional dependency hold:

$\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$

What are the candidate key of R?

(A) AE, BE

(B) AE, BE, DE

(C) AEH, BEH, BCH

(D) AEH, BEH, DEH

[GATE-2005]

Q.37 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.

[GATE-2005]

Q.38 A table has fields, F1, F2, F3, F4, F5, with the following functional dependencies: $F1 \rightarrow F3, F2 \rightarrow F4, (F1.F2) \rightarrow F5$ in terms of Normalization, this table is in

- (A) 1NF
- (B) 2NF
- (C) 3NF
- (D) None of these

[GATE-2005]

Q.39 A relation Empdt1 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 the state, there is just one pincode. In normalization terms, Empdt1 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

[GATE-2004]

Q.40 The relation scheme Student Performance (name, courseNo, rollNo, grade) has the following functional dependencies:

$\text{name, courseNo} \rightarrow \text{grade}$
 $\text{rollNo, courseNo} \rightarrow \text{grade}$
 $\text{name} \rightarrow \text{rollNo}$
 $\text{rollNo} \rightarrow \text{name}$

The highest normal form of this relation scheme is

- (A) 2NF
- (B) 3NF
- (C) BCNF
- (D) 4NF

[GATE-2004]

Q.41 Consider the following relation schema pertaining to a students database:

Student (rollNo, name, address)

Enroll (rollNo, courseno, coursename)

Where the primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 120 and 8 respectively. What are the maximum and minimum number of tuples that can be present in (Student * Enroll), where '*' denotes natural join?

- (A) 8, 8
- (B) 120, 8
- (C) 960, 8
- (D) 960, 120

[GATE-2004]

Q.42 Consider the following functional dependencies in a database.

- Date_of_Birth \rightarrow Age
- Age \rightarrow Eligibility
- Name \rightarrow Roll_number
- Roll_number \rightarrow Name
- Course_number \rightarrow Course_name
- Course_number \rightarrow Instructor
- (Roll_Number, Course_number) \rightarrow Grade

The relation (Roll_number, Name, Date_of_Birth, Age) is

partial dependency

(Roll) (DOB) \rightarrow C.K

(Name) (DOB) \rightarrow C.K

1NF

(A) In 2nd NF but not in 3rd NF

(B) In 3rd NF but not in BCNF

(C) In BCNF

(D) None of the above

[GATE-2003]

Q.43 From the following instance of a relation schema R (A, B, C) we can conclude that :

means

Part of Relation

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

may be original

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'.

[GATE-2002]

Q.44 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 relation is

(A) Zero

(B) More than zero but less than that of equivalent 3NF decomposition

(C) Proportional to the size of F⁺

(D) Indeterminate

[GATE-2002]

Q.45 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

[GATE-2002]

Q.46 Consider the schema R = (S T U V) and the dependencies S → T, T → U, U → V and V → S let R = (R1 and R2) be a decomposition such that R1 ∩ R2 ≠ ∅. The decomposition is:

(A) Not in 2NF

(B) In 2NF but not in 3NF

(C) In 3NF but not in 2NF

(D) In both 2NF and 3NF

[GATE-1999]

Q.47 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 → Z and Z → Y

(B) YZ → X and Y → Z

(C) YZ → X and X → Z

(D) XZ → Y and Y → X

[GATE-2000]

Q.48 Consider a schema $R(A, B, C, D)$ and functional dependencies $A \rightarrow B$ and $C \rightarrow D$. Then the decomposition of R into $R_1(AB)$ and $R_2(CD)$ 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.

[GATE-2001]

Q.49 $R(A, B, C, D)$ is a relation. Which of the following does not have a lossless-join, dependency preserving BCNF decomposition? $\rightarrow C$

- (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) $A \rightarrow BCD$

[GATE-2001]

Q.50 Which normal form is considered adequate for normal relational database design?

- (A) 2 NF (B) 5 NF (C) 4 NF (D) 3 NF

[GATE-1998]

Q.51 Consider the following two statements about data base transaction schedules :

- I. Strict two-phase locking protocol generates conflict serializable schedules that are also recoverable.
 II. Time stamp ordering concurrency control protocol with Thomas Write rule can generate view serializable schedules that are not conflict serializable.

Which of the above statements is/are true.

- (A) I only (B) II only
 (C) Both I and II (D) Neither I nor II

[GATE-2019]

Q.52 Consider the following database schedule with two transactions. T_1 and T_2 .

T_1	T_2
	$r(x)$
$r(x)$	
	$r(y)$
$w(x)$	
$r(y)$	
	$w(x)$
α_1	α_2

Where $r_i(Z)$ denotes a read operation by transaction T_i on a variable Z , $w_i(Z)$ denotes a write operation by T_i on a variable Z and α_i denotes an abort by transaction T_i . Which one of the following statements about above schedule is TRUE?

- (A) S is non-recoverable (B) S is recoverable, but has a cascading abort
 (C) S does not have a cascading abort (D) S is strict

[GATE-2016]

Q.53 Suppose a database schedule S involves transactions T_1, \dots, T_n . Construct the precedence graph of S with vertices representing the transactions and edges representing the conflicts. If S is serializable, which one of the following orderings of the vertices of the precedence graph is guaranteed to yield a serial schedule?

- (A) Topological order (B) Depth-first order
 (C) Breadth-first order (D) Ascending order of transaction indices

[GATE-2016]

Q.54 Consider the following two phase locking protocol. Suppose a transaction T accesses (for read or write operations), a certain set of objects $\{O_1, \dots, O_k\}$. This is done in the following manner.

Step 1: T acquires exclusive locks to $\{O_1, \dots, O_k\}$ in increasing order of their addresses.

Step 2: The required operations are performed

Step 3: All locks are released.

This protocol will

- (A) Guarantee serializability and deadlock-freedom
- (B) Guarantee neither serializability nor deadlock-freedom
- (C) Guarantee serializability but not deadlock-freedom
- (D) Guarantee deadlock-freedom but not serializability

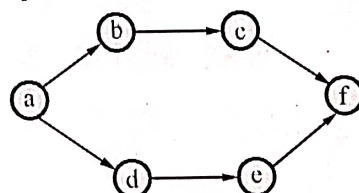
[GATE-2016]

Q.55 Which one of the following is NOT a part of the ACID properties of database transactions?

- (A) Atomicity
- (B) Consistency
- (C) Isolation
- (D) Deadlock-freedom

[GATE-2016]

Q.56 Consider the following directed graph :



$$a - \dots - f$$

$$= \frac{4!}{2!2!} = 6$$

The number of different topological ordering of the vertices of the graph is 6 [GATE-2016]

Q.57 Consider the following partial Schedule S involving two transactions T1 and T2. Only the read and the write operations have been shown. The read operation on data item P is denoted by read (P) and the write operation on data item P is denoted by write (P).

Time instance	Transaction - id	
	T1	T2
1	Read(A)	
2	Write(A)	
3		Read(C)
4		Write(C)
5	Read(B)	Read(B)
6	Write(B)	
7		Read(A)
8		commit
9	Read(B)	

Schedule S

Suppose that the transaction T1 fails immediately after time instance 9. Which one of the following statements is correct?

- (A) T2 must be aborted and then both T1 and T2 must be re-started to ensure transaction atomicity
- (B) Schedule S is non-recoverable and cannot ensure transaction atomicity

- (C) Only T2 must be aborted and then re-started to ensure transaction atomicity
 (D) Schedule S is recoverable and can ensure atomicity and nothing else needs to be done.

[GATE-2015]

Q.58 Consider a simple checkpointing protocol and the following set of operations in the log.

(Start, T4);
 (Write, T4, y, 2, 3);
 (Start, T1);
 (Commit, T4);
 (Write, T1, z, 5, 7);

(Checkpoint);

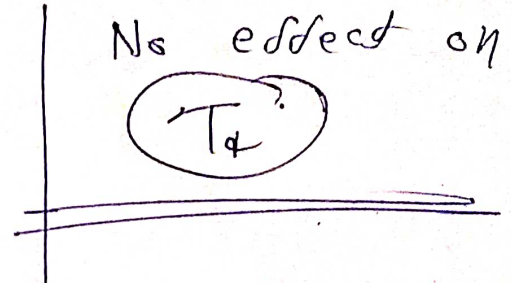
(Start, T2);

(Write, T2, x, 1, 9);

(Commit, T2);

(Start, T3);

(Write, T3, z, 7, 2);



If a crash happens now the system tries to recover using both undo and redo operations, what are the contents of the undo list and the redo list?

- (A) Undo: T3, T1; Redo: T2
 (B) Undo: T3, T1; Redo: T2, T4
 (C) Undo: none; Redo: T2, T4, T3, T1
 (D) Undo: T3, T1, T4; Redo: T2

[GATE-2015]

Q.59 Consider the following transaction involving two bank accounts x and y.

read(x);
 $X := x - 50$;
 Write (x);
 read (y);
 $Y := y + 50$;
 write(y);

The constraint that the sum of the accounts x and y should remain constant is that of

- (A) Atomicity (B) Consistency (C) Isolation (D) Durability

[GATE-2015]

Q.60 Consider the transactions T1, T2 and T3 are the schedules S1 and S2 given below.

T1: rl (x); rl (z); wl (x); wl (z)

T2: r2 (y); r2 (z); w2 (z)

T3: r3 (y); r3 (x); w3 (y)

S1: rl (x); r3 (y); r3 (x); r2 (y); r2 (z); w3 (y); w2 (z); rl (z); wl (x); wl (z)

S2: rl (x); r3 (y); r2 (y); r3 (x); rl (z); r2 (z); w3 (y); wl (x); w2 (z); wl (z)

Which one of the following statements about the schedule is TRUE?

- (A) Only S1 is conflict serializable
 (B) Only S2 is conflict serializable
 (C) Both S1 and S2 are conflict serializable
 (D) Neither S1 nor S2 is conflict serializable.

[GATE-2014]

