

Choose the correct answer(s) for the following multiple choice questions. Each question has at least one correct answer.

1-5. Consider the relational schema $S[\underline{ID}, A, B, C, D, E, F]$ with the primary key $\{ID\}$. S has no other candidate keys. Answer questions 1-5 using the legal instance below:

ID	A	B	C	D	E	F
t1	a1	b2	Și abia plecă bătrânul... Ce mai freamăt, ce mai zbucium!	0	1	0
t2	a1	b2	Codrul clocoti de zgomot și de arme și de bucium,	1	2	1
t3	a1	b3	Iar la poala lui cea verde mii de capete pletoase,	0	3	0
t4	a1	b3	Mii de coifuri lucitoare ies din umbra-ntunecoasă;	2	123	-1
t5	a1	b3	Călăreții umplu câmpul și roiesc după un semn	-1	4	-1

1. When executed on the above instance S :

a. query `SELECT DISTINCT A, B FROM S` returns 2 tuples.

b. query `SELECT * FROM S WHERE B = 'b2' AND B = 'b3'` returns 0 tuples.

c. query

`SELECT * FROM S WHERE B = 'b3'`
`UNION`

`SELECT * FROM S WHERE B = 'b3'`
returns 1 tuple.

d. query

`SELECT * FROM S WHERE D >= 0`
`EXCEPT`

`SELECT * FROM S WHERE E <> 4`
returns 0 tuples.

e. none of the above answers is correct.

2. Consider projections $S1[ID, A, B, C, F]$ and $S2[D, E, F]$. The result of the natural join $S1 \bowtie S2$ contains (column order is not important):

a. only the 5 tuples in S

b. 7 tuples, out of which 5 are the original tuples in S

c. no tuples

d. 9 tuples, out of which 5 are the original tuples in S

e. none of the above answers is correct.

3. How many records does the query below return?

`SELECT B, C, COUNT(*)`

`FROM S`

`GROUP BY B, C`

`HAVING D <= 1`

a. 5

b. 4

c. 3

d. 2

e. none of the above answers is correct.

4. How many records does the query below return?

`SELECT *`

`FROM S`

`WHERE C LIKE 'de%'`

a. 3

b. 0

c. 5

d. 1

e. none of the above answers is correct.

5. Regarding the functional dependencies of S :

a. at least one of the following dependencies is not satisfied by the instance:
 $\{ID, A\} \rightarrow \{D, E\}$, $\{B\} \rightarrow \{A\}$, $\{A, B\} \rightarrow \{D\}$

b. by examining the instance, we can conclude that at least one of the following

dependencies is specified on the schema S:
 $\{A\} \rightarrow \{D, E\}$, $\{B\} \rightarrow \{A\}$, $\{A, B\} \rightarrow \{D\}$

c. at least two of the following dependencies are not satisfied by the instance:
 $\{C\} \rightarrow \{A\}$, $\{A\} \rightarrow \{C\}$, $\{E\} \rightarrow \{B\}$,
 $\{F\} \rightarrow \{A\}$

d. by examining the instance, we can conclude that at least two of the following dependencies are specified on the schema S:
 $\{C\} \rightarrow \{A\}$, $\{A\} \rightarrow \{C\}$,
 $\{E\} \rightarrow \{B\}$, $\{F\} \rightarrow \{A\}$

e. none of the above answers is correct.

6. In a DBMS, the buffer manager:

a. manages disk space

b. brings pages from the disk into main memory

c. monitors lock requests

d. produces an efficient execution plan for query evaluation

e. none of the above answers is correct.

7. A SELECT statement:

a. can contain a HAVING clause only if it contains a WHERE clause

b. can contain a WHERE clause only if it contains a HAVING clause

c. can contain a HAVING clause only if it contains an ORDER BY clause

d. can contain a GROUP BY clause only if it contains a HAVING clause

e. none of the above answers is correct.

8. Let $R[\underline{ID1}, \underline{ID2}, \underline{ID3}, \underline{A}, \underline{B}, C, D, E, F, G]$ be a relational schema with no repeating attributes. The keys of R are $\{ID1, ID2, ID3\}$ and $\{A, B\}$. The following dependencies hold: $\{ID1, ID2\} \rightarrow \{C\}$ and $\{A\} \rightarrow \{G\}$. R is:

a. 1NF

b. 2NF

c. 3NF

d. BCNF

e. none of the above answers is correct.

9. On a magnetic disk, disk access time includes:

a. lunch time

b. seek time

c. rotational delay

d. transfer time

e. none of the above answers is correct.