

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

Good luck!

Hi OANA-MARIA, when you submit this form, the owner will be able to see your name and email address.



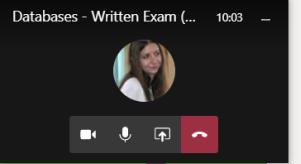
Choose the correct answer(s) for multiple choice questions 1-15. Each question has at least one correct answer.

For questions 1-7: Let S be a table in a SQL Server database with schema S{ID, A, B, C, D, E}. The primary key is {ID}. Answer questions 1-7 using the legal instance below.

ID	A	B	C	D	E
1	Si abia pleca batranul... Ce mai freamat, ce mai zbucium!	0	1	7	15
2	Codrul clocoți de zgomot și de arme și de bucium,	0	2	1	9
3	Iar la poala lui cea verde mii de capete pletoase,	0	3	2	9
4	Mii de coifuri lucitoare ies din umbra-ntunecoasa;	1	3	-3	15
5	Calareti umplu campul și roiesc după un semn	1	2	-3	9
6	Si în caii lor salbatici bat cu scarile de lemn,	1	1	4	8
7	Pe copite iau în fugă fata negrului pamant,	1	0	5	8
8	Lanci scanteie lungi în soare, arcuri se intind în vant,	2	0	3	5
9	Si ca nouri de arama și ca ropotul de grindenți,	2	0	4	3
10	Orizontu-ntunecandu-l, vin sageti de pretutindeni,	3	2	5	4
11	Vajaind ca vijelia și ca plesnetul de ploaie...	3	2	2	5
12	Urila camnul și de tronot și de striat de hataie	3	5	1	3

1

When executed on the above instance S:
(5 Points)



Type here to search



11:05 AM 1/19/2021 ENG 3

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

When executed on the above instance S:
(5 Points)

query `SELECT DISTINCT D, E FROM S` returns 12 tuples.
 query `SELECT * FROM S WHERE C <= 3` returns 12 tuples.
 query `SELECT * FROM S WHERE B IN (SELECT * FROM S)` returns 12 tuples.
 query `SELECT * FROM S WHERE B >= 1 INTERSECT SELECT * FROM S WHERE E < 9` returns 8 tuples.
 None of the above answers is correct.

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

only the 12 tuples in S .
 24 tuples, out of which 12 are the original tuples in S .
 no tuples.
 26 tuples, out of which 12 are the original tuples in S .
 None of the above answers is correct.

Type here to search

Activity Chat Teams Assignments Calendar Calls Files Apps Help

Close

10:50

Databases - Written Exam (... 11:06 AM ENG 1/19/2021 3

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

3

The query on the right:
(5 Points)

```
SELECT S1.B, COUNT(*)  
FROM S s1 INNER JOIN S s2 ON s1.ID = s2.ID  
GROUP BY s1.B  
HAVING COUNT(*) >= 2
```

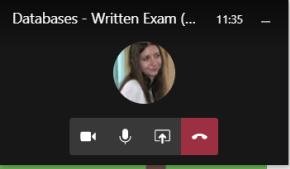
- returns 3 rows.
- returns 4 rows.
- returns 1 row.
- returns 2 rows.
- None of the above answers is correct.

4

The query on the right: 
(5 Points)

```
SELECT *  
FROM S s1, S s2  
WHERE s1.C > ANY (SELECT D FROM S)  
OR s2.C > ALL (SELECT E FROM S)
```

- has a syntax error.
- returns 12 tuples.
- returns 24 tuples.
- returns 144 tuples.
- None of the above answers is correct.



Activity

Chat

Teams

Assignments

Calendar

Calls

Files

...

Apps

Help

Type here to search

11:07 AM 1/19/2021

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

5

The query on the right:
(5 Points)

The schema of a result tuple is {ID, NJ}.

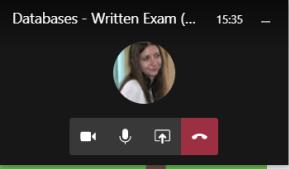
```
SELECT s1.ID, COUNT(*) N  
FROM S s1 INNER JOIN S s2 ON s1.B = s2.E  
GROUP BY s1.ID
```

- returns 2 tuples: <10, 2>, <11, 2>.
- returns 3 tuples: <10, 2>, <11, 2>, <12, 2>.
- returns 2 tuples: <10, 3>, <11, 3>.
- returns 3 tuples: <10, 3>, <11, 3>, <12, 3>.
- None of the above answers is correct.

6

Regarding the functional dependencies of S: 
(5 Points)

- at least one of the following dependencies is not satisfied by the instance: {ID} → {A}, {A} → {B}, {B} → {C}.
- by examining the instance, we can conclude that at least one of the following dependencies is specified on the schema S: {A} → {B, C}, {B} → {C, D}, {C} → {D, E}.
- at least two of the following dependencies are not satisfied by the instance: {A} → {C}, {C, D, E} → {C, D}, {ID, A} → {B}, {C} → {B}, {ID} → {A, B, C, D}.



Activity

Chat

Teams

Assignments

Calendar

Calls

Files

...

Apps

Help

Type here to search

11:11 AM 1/19/2021 ENG 1/19/2021

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Activity Chat Teams Assignments Calendar Calls Files ... Apps Help

Search

Close

7

The query on the right:
(5 Points)

```
SELECT s1.B, SUM(s1.D)
FROM S s1 LEFT JOIN (SELECT *
                      FROM S s2
                      WHERE s2.E >= 5
                   ) t ON s1.B = t.E
WHERE t.ID IS NOT NULL
GROUP BY s1.B
```

at least two of the following dependencies are not satisfied by the instance: {A} → {C}, {C, D, E} → {C, D}, {ID, A} → {B}, {C} → {B}, {ID} → {A, B, C, D}.
 by examining the instance, we can conclude that at least two of the following dependencies are specified on the schema S: {A} → {B, C}, {B} → {D}, {E, A} → {B}, {E, C} → {B}, {C} → {A}.
 None of the above answers is correct.

Type here to search

11:11 AM 1/19/2021

Activity

Chat

Teams

Assignments

Calendar

Calls

Files

...

Apps

Help

Search

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

8

A data description model can be used to describe:
(2.5 Points)

- the structure of the data.
- IF statements.
- relationships with other data.
- consistency constraints.
- None of the above answers is correct.

9

The full outer join operator in the relational algebra $R1 \bowtie R2$ returns a relation whose schema contains:

(2.5 Points)

- only the attributes in R2 that don't appear in R1.
- only the attributes in R1 that don't appear in R2.
- all the attributes in R1 followed by all the attributes in R2.
- only attributes that appear in both R1 and R2.



11:12 AM 1/19/2021

Activity

Chat

Teams

Assignments

Calendar

Calls

Files

... Apps Help

Search

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

A data description model can be used to describe:
(2.5 Points)

- the structure of the data.
- IF statements.
- relationships with other data.
- consistency constraints.
- None of the above answers is correct.

9
The full outer join operator in the relational algebra $R1 \bowtie R2$ returns a relation whose schema contains:
(2.5 Points)

- only the attributes in R2 that don't appear in R1.
- only the attributes in R1 that don't appear in R2.
- all the attributes in R1 followed by all the attributes in R2.
- only attributes that appear in both R1 and R2.
- None of the above answers is correct.

11:12 AM 1/19/2021

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

Activity

Chat

Teams

Assignments

Calendar

Calls

Files

...

Apps

Help

Type here to search

10

In a DBMS, the buffer manager:
(2.5 Points)

- brings pages from the disk into main memory.
- monitors lock requests.
- produces an efficient execution plan for query evaluation.
- manages disk space.
- None of the above answers is correct.

11

In a SQL query:

(2.5 Points)

- the HAVING clause is mandatory.
- the HAVING clause is optional.
- the FROM clause is mandatory.
- the FROM clause is optional.
- None of the above answers is correct.

11:13 AM 1/19/2021

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

12

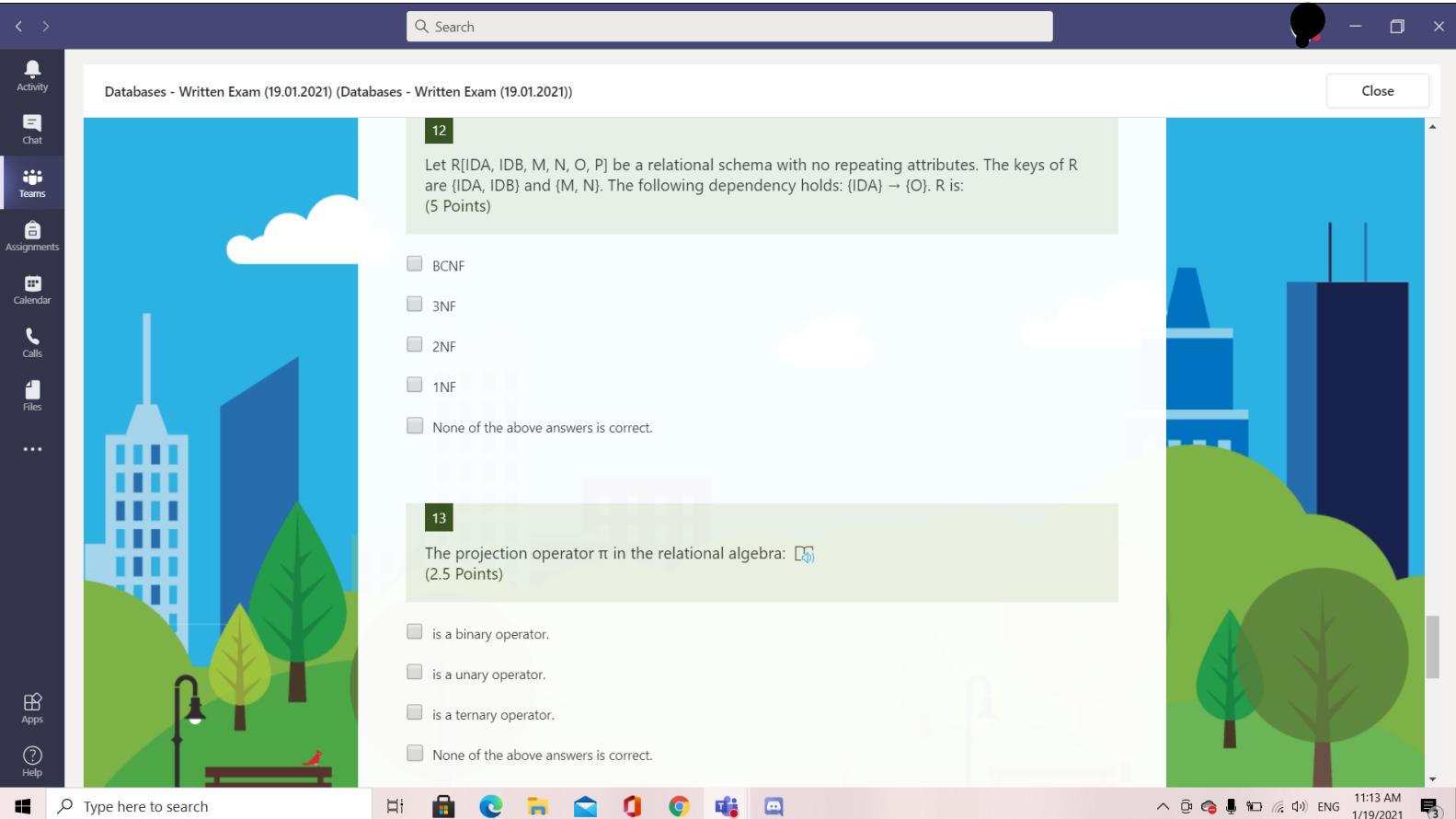
Let $R[IDA, IDB, M, N, O, P]$ be a relational schema with no repeating attributes. The keys of R are $\{IDA, IDB\}$ and $\{M, N\}$. The following dependency holds: $\{IDA\} \rightarrow \{O\}$. R is:
(5 Points)

- BCNF
- 3NF
- 2NF
- 1NF
- None of the above answers is correct.

13

The projection operator π in the relational algebra: 
(2.5 Points)

- is a binary operator.
- is a unary operator.
- is a ternary operator.
- None of the above answers is correct.



A screenshot of a Windows desktop showing a Microsoft Teams window for a written exam. The window title is "Databases - Written Exam (19.01.2021)". The main content area contains two questions, each with a numbered box (12 and 13) and a text box describing the question and its point value. Below each question is a list of multiple-choice options with checkboxes. The desktop taskbar at the bottom shows various pinned icons, and the system tray indicates the date and time as 11:13 AM on 1/19/2021.

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

14

Let α , β and γ be subsets of attributes in a relational schema. According to the union rule, if $\alpha \rightarrow \beta$ and $\alpha \rightarrow \gamma$, then:
(5 Points)

- $\gamma \rightarrow \alpha\beta$
- $\alpha \rightarrow \beta\gamma$
- $\beta\gamma \rightarrow \alpha$
- $\gamma \rightarrow \alpha$
- None of the above answers is correct.

15

In a B-tree of order 9: 
(5 Points)

- a non-terminal node has at most 8 subtrees.
- a non-terminal node has at most 9 subtrees.
- a non-terminal node with 6 values has 7 subtrees.
- a non-terminal node with 6 values has 5 subtrees.

Type here to search



11:13 AM 1/19/2021 ENG 3

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

Let α , β and γ be subsets of attributes in a relational schema. According to the union rule, if $\alpha \rightarrow \beta$ and $\alpha \rightarrow \gamma$, then:
(5 Points)

- $\gamma \rightarrow \alpha\beta$
- $\alpha \rightarrow \beta\gamma$
- $\beta\gamma \rightarrow \alpha$
- $\gamma \rightarrow \alpha$
- None of the above answers is correct.

15
In a B-tree of order 9: 
(5 Points)

- a non-terminal node has at most 8 subtrees.
- a non-terminal node has at most 9 subtrees.
- a non-terminal node with 6 values has 7 subtrees.
- a non-terminal node with 6 values has 5 subtrees.
- None of the above answers is correct.

Type here to search



11:13 AM 1/19/2021

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

II

Answer the following questions / solve the following problems.

As a backup, email the uploaded files to sabina@cs.ubbcluj.ro. Use your scs or stud email address and sign your mail.

For question 16: Let S be a table in a SQL Server database with schema S[ID1, ID2, C1, C2, C3, C4, C5]. The primary key is {ID1, ID2}. Answer question 16 using the legal instance below.

ID1	ID2	C1	C2	C3	C4	C5
23	1	4	8	4	9	3
24	1	4	7	5	9	3
24	5	2	7	6	9	3
24	6	1	7	7	9	3
25	1	2	5	8	8	3
25	2	2	5	10	8	4
25	3	1	5	9	8	4
26	1	1	5	11	8	4
100	1	5	2	1	10	1
100	2	5	8	2	9	2
100	3	5	8	3	9	2

16

a. What are the result sets returned by queries Q1 and Q2 in the image below? Write the

Type here to search



11:01 AM 1/19/2021 ENG 3

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

16

a. What are the result sets returned by queries Q1 and Q2 in the image below? Write the tuples' values and the names of the columns.

b. Write the relational algebra expression in the image below as a SQL query.

Upload a pdf file named Group_LastName_FirstName_16.pdf (e.g., 929_Ionescu_Ana_16.pdf) that contains the answers for a and b. (Non-anonymous question)  (15 Points)

Query Q1:

```
SELECT s1.ID1, COUNT(*) N
FROM S s1 INNER JOIN S s2 ON s1.C1 = s2.C2
GROUP BY s1.ID1
EXCEPT
SELECT s1.ID1, COUNT(*) N
FROM S s1 LEFT JOIN S s2 ON s1.C1 = s2.C2
GROUP BY s1.ID1
```

Query Q2:

```
SELECT s1.ID1, COUNT(*) N
FROM S s1 INNER JOIN S s2 ON s1.C1 = s2.C2
GROUP BY s1.ID1
HAVING COUNT(*) > 1
INTERSECT
```



INTERSECT
SELECT s1.ID1, COUNT(*) N
FROM S s1 LEFT JOIN S s2 ON s1.C1 = s2.C2
GROUP BY s1.ID1
HAVING COUNT(*) < 3

Relational algebra expression:

$\pi_{\{C1,C2,C3,C4\}}((\pi_{\{ID2,C3,C4\}}S) \otimes_{ID2=ID1} (\pi_{\{ID1,C1,C2\}}(\sigma_{C1 \geq 2}S)))$

Upload file

File number limit: 1 Single file size limit: 10MB Allowed file types: PDF

17

Write a SELECT statement that has a GROUP BY clause, a HAVING clause, and uses the ANY operator.  (2.5 Points)

Enter your answer

Databases - Written Exam (19.01.2021) (Databases - Written Exam (19.01.2021))

Close

Activity Chat Teams Assignments Calendar Calls Files ... Apps Help

Search

17

Write a SELECT statement that has a GROUP BY clause, a HAVING clause, and uses the ANY operator. [\(2.5 Points\)](#)

Enter your answer

18

Let A, B, C, D be 4 relations with schemas A[ID, A1, A2, A3], B[B1, B2], C[C1, C2], D[D1, D1], and E an expression in the relational algebra.

Optimize E and draw the evaluation tree for the optimized version of the expression.

Upload the tree as a pdf, png or jpg file named Group_LastName_FirstName_18.ext (e.g., 929_Jonescu_Ana_18.pdf). (Non-anonymous question) [\(10 Points\)](#)

$E = (\sigma_{ID = B1 \text{ AND } A2='exam' \text{ AND } B2='DB'} (A \times B)) * (\sigma_{C1=3} (C \times D))$

Upload file

File number limit: 1 Single file size limit: 10MB Allowed file types: PDF, Image

11:02 AM 1/19/2021

