Corrected

Uppsala University
Department of Information Technology
Database Design I (1DL300/1) – 2017-04-22

Instructions: Read through the complete exam and note any unclear directives before you start solving the questions. For each question there can be one or more correct answers, but you can choose only one. If you choose a correct answer, you gain 3 points. A wrong answer does not generate negative points – but the teacher reserves the right to penalize answers that are outrageously wrong. The questions are divided into three sections with 7 questions each. To achieve a grade of 3, you must gain at least 9 points in each section and at least 36 in the whole exam. To achieve a grade of 4, you must gain at least 45 points in the whole exam. To achieve a grade of 5, you must collect at least 54 points in the whole exam. You are allowed to use dictionaries to and from English, but no other material. When you are done, **detach the answer sheet and return only it** (keep the questions for you). To mark an answer fill in the box *completely* (that is, not just crossing it) *using a pen*: if the correction software cannot detect your answers because you are not following the instructions, you will not get any points...

1 General questions (useful for us)

Question 1 ♣ When have you attended the course?

- [A] Period 1, 2016
- [B] Period 2, 2016
- [C] Period 1, 2015
- [D] Period 2, 2015
- [E] None of the previous answers

Question 2 ♣ How many lectures have you attended?

- [A] None or very few
- [B] Around 25%
- [C] Around 50%
- [D] Around 75%
- [E] Almost all

Question 3 ♣ What is your study program?

- [A] F
- [B] STS
- [C] CS
- [D] X
- [E] IT
- [F] None of the previous answers

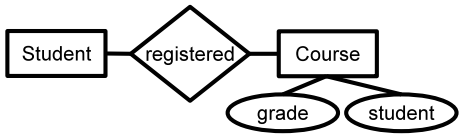
Question 4 ♣ Have you attended the lecture on exam preparation?

- [A] Do not remember
- [B] Yes
- [C] No

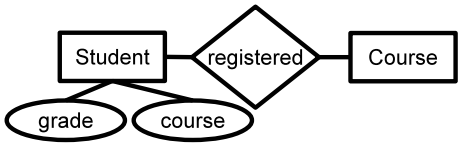
2 Database design

Question 5 Which of the following ER diagrams indicates the best location(s) where to store information about the students' grades? (only a portion of the diagram has been visualized)

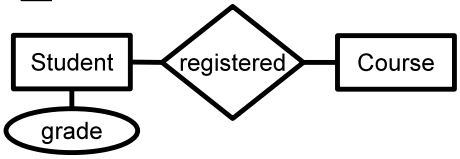
A



B

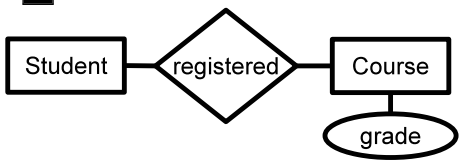


D

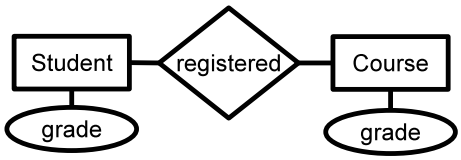


■ None of the other answers

E



F



Question 6 Which of the following ER diagrams corresponds to the following requirements? *Every entity in E1 is connected to exactly one entity in E2. Each entity in E2 can be connected to 0, 1 or more entities in E1.*

A

B

C

D

E

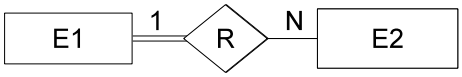
F

■

Question 7 Which of the following ER diagrams corresponds to the following requirement? *Every entity in E2 is connected to exactly one entity in E1.* (only a portion of the diagram has been visualized)

A

B

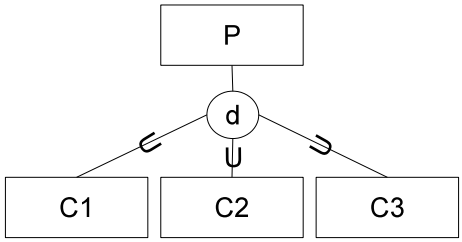


C

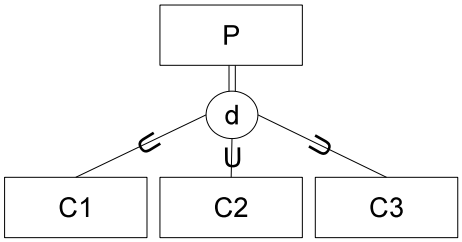
■ None of the other answers

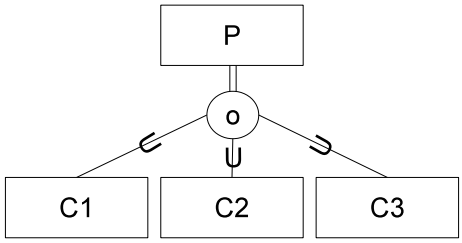
Question 8 Entity type P is of type C1, C2 or C3. It can be of more than one type at the same time. Which of the following ER diagrams corresponds to these specifications? (only a portion of the diagram has been visualized)

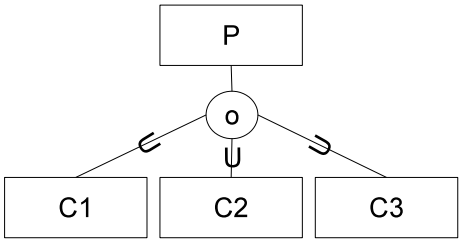
A



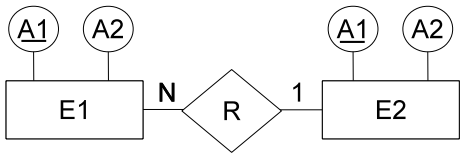
B



■ 

D 

Question 9 Which relational schema corresponds to the following ER diagram?



A $E1(\underline{A1}, A2)$, $E2(\underline{A1}, A2)$, $R(E1, \underline{E2})$ (with $R.E1$ FK ref. $E1.A1$ and $R.E2$ FK ref. $E2.A1$)

B $E1(\underline{E2, A1}, A2)$, $E2(\underline{A1}, A2)$ (with $E1.E2$ FK ref. $E2.A1$)

■ $E1(\underline{A1}, A2, E2)$, $E2(\underline{A1}, A2)$ (with $E1.E2$ FK ref. $E2.A1$)

D $E1(\underline{A1}, A2)$, $E2(\underline{A1}, A2)$, $R(\underline{E1, E2})$ (with $R.E1$ FK ref. $E1.A1$ and $R.E2$ FK ref. $E2.A1$)

E $E1(\underline{A1}, A2)$, $E2(\underline{A1}, A2, E1)$ (with $E2.E1$ FK ref. $E1.A1$)

F $E1(\underline{A1}, A2)$, $E2(\underline{A1}, A2)$

G None of the other answers

Question 10 Consider the relation corresponding to the following SQL statement:
CREATE TABLE R (A int, B int, C int, PRIMARY KEY (A,B)~~, C~~)
and assume that there is also a functional dependency $C \to B$. Which of the following is true?

■ R is in BCNF but not in 3NF Typo in the question

■ R is in 3NF but not in 2NF

■ R is in 1NF but not in 2NF

■ R is in BCNF

■ R is in 3NF but not in BCNF

■ R is in 2NF but not in 3NF

■ None of the other answers

Question 11 Consider a relation in 1NF $R(A, B, C, D, E)$ with the following dependencies:

- $A, B \to C, D, E$
- $B \to C$

Which of the following is true?

A None of the other answers

B R is in 3NF but not in BCNF

C R is in BCNF but not in 3NF

■ R is not in 2NF

E R is in 3NF but not in 2NF

F R is in BCNF

G R is in 2NF but not in 3NF

3 SQL

Consider the following database:

T1

C1	C2
A	B
A	C
B	A
A	C

T2

C1	C2
A	C
A	D
B	B
D	C

Question 12 What is the result of the following SQL query? (showing only the content)
SELECT COUNT(DISTINCT C2)
FROM T2
GROUP BY DISTINCT C1

A | 1 / 0 / 1 | B An empty table | C 3 | D 4

E None of the other answers | ■ The SQL is incorrect | G | 1 / 1 / 1 |

Question 13 What is the result of the following SQL query? (showing only the content)
SELECT DISTINCT T1.C1, T2.C2
FROM T1 Join T2 on T1.C1=T2.C1
WHERE T1.C2=T2.C2

A

A	C
A	D
A	C

B

A	C
A	C

C The SQL is incorrect

D

A	C
A	D
B	B
A	C

■

A	C

F An empty table | G None of the other answers

Question 14 What is the result of the following SQL query? (showing only the content)
SELECT C1 FROM T1
UNION
SELECT C2 FROM T2

A

A
A
B
B
B
C
B
C

B

A	C
A	B
B	B
B	C

C The SQL is incorrect

D None of the other answers

E

A	B	C	D

F

A	C	A	B	B	B	B	C

■

A
B
C
D

Question 15 What is the result of the following SQL query? (showing only the content)
SELECT C2 FROM T1
WHERE C2 NOT IN
(SELECT C1 FROM T2)

A
A
A
B

B An empty table

C The SQL is incorrect

D None of the other answers

E
B

F
A
A
B
B

■
C
C

Question 16 What is the result of the following SQL query? (showing only the content)
SELECT T1.C1, count(T2.C2)
FROM T1 Join T2 on T1.C1=T2.C1
WHERE T1.C2=T2.C2
GROUP BY T1.C1

A
A	2
B	2

B The SQL is incorrect

■
A	2

D None of the other answers

E
A	3
B	1

F An empty table

G
A	2
B	1

Question 17 What is the result of the following SQL query? (showing only the content)
SELECT C1 FROM T1
WHERE C2 NOT IN
(SELECT C1 FROM T2
WHERE C1>T1.C1)

A None of the other answers

B An empty table

C The SQL is incorrect

D
B

■
A
B
A

F
A
A
B
B

G
A

Consider the following database:
Student(<u>SID</u>, Name, Surname, Age)
Registration(<u>StudentID, CourseID</u>)
Course(<u>CID</u>, Name, Cost)

Question 18 Consider the following incomplete SQL query:
SELECT SID
FROM Student
WHERE ------ (
SELECT CourseID
FROM Registration JOIN Course ON CourseID = CID
WHERE Name = 'Database Design IV' AND StudentID=SID)
Which of the following texts should be added so that the query extracts the students who attended courses whose name is 'Database Design IV'?

A SID NOT IN

B NOT EXISTS

C SID NOT EXISTS

■ EXISTS
E None of the other answers
F SID EXISTS
G SID =ANY

4 Theory

Question 19 If table T has a UNIQUE (A1, A2) constraint and we execute the following SQL queries:
Q1: SELECT COUNT(*) FROM T
Q2: SELECT COUNT(distinct A1) FROM T
Q3: SELECT COUNT(A1) from T

A The results of Q1 and Q3 are the same, while the result of Q2 can be different
B The results of Q1, Q2 and Q3 are the same
C The result of Q2 is always lower than the result of Q3 (but not of Q1)
■ None of the other answers
E The results of Q1 and Q2 are the same, while the result of Q3 can be different
F The result of Q2 is always lower than the results of both Q1 and Q3

Question 20 If a relation is in BCNF then:

A It cannot be in 3NF at the same time
B It is also in 3NF only if all candidate keys are made of single attributes
■ It is also in 3NF
D None of the other answers (it cannot be in BCNF)
E It allows anomalies that are not allowed in 3NF
F It is also in 3NF only if aat least one candidate key is made of a single attribute

Question 21 Consider a relation $R(A, B, C, D)$ in 1NF, where A and B are the only candidate keys. Then:

A R is at least in 3NF
B R can be in 1NF but not in 2NF
■ R is at least in 2NF
D None of the other answers
E R is at least in BCNF

Question 22 In the relational model, if an attribute K is a candidate key of a relation R and X is an attribute of R different from K then:

A None of the other answers
B $\{K, X\}$ is also a candidate key
■ $\{K, X\}$ is always a super key (even if X is not a candidate key)
D X cannot be the primary key of R
E X cannot be a candidate key
F K is also a primary key of R

Question 23 Consider a relation $R(\underline{A}, B, C, D)$ containing 10^7 records. A is the primary key, and B contains 10^5 distinct values. The following SQL prepared statements are executed very frequently:
UPDATE R SET B=? WHERE C=?
SELECT D FROM R WHERE A=?
Considering these statements, on which attributes would you create indexes?

- [A] One single index on (B, D)
- [■] One index on A and one on C
- [C] One index on B and one on D
- [D] One index on A, one on D
- [E] One index on R
- [F] One index on B
- [G] One index on A

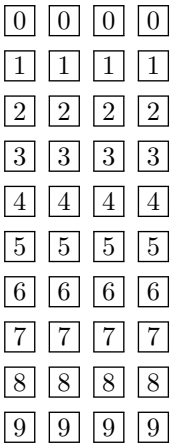
Question 24 Which of the following is true if a transaction is executed at isolation level SERIALIZABLE?

- [■] SELECT B FROM T WHERE A=1 may return different results if executed multiple times inside the transaction (A is the primary key)
- [B] A join that returns a non-empty table, if consecutively re-executed inside the transaction may return an empty result
- [C] SELECT COUNT(*) FROM T may return different results if executed multiple consecutive times inside the transaction
- [D] None of the other answers is true
- [E] SELECT B FROM T WHERE A=1 may return different results if executed multiple consecutive times inside the transaction (A is the primary key)

Question 25 User Bob creates a table called X. Then, the following sequence of statements is executed, in this order (the name of the user executing the statement is indicated at the beginning of each statement, and we assume that the system follows the SQL standard):
Bob: GRANT select ON X TO Jim WITH GRANT OPTION
Bob: GRANT select ON X TO Ann WITH GRANT OPTION
Ann: GRANT update ON X TO Tim WITH GRANT OPTION
Tim: GRANT update ON X TO Jim
Bob: REVOKE select ON X FROM Ann CASCADE
Which privileges does Jim have?

- [A] select with grant option, update without grant option
- [B] select, update, both with grant option
- [C] only the grant option
- [D] select, update, both without grant option
- [E] none
- [F] select without grant option
- [■] select with grant option

Answer sheet:



←— please write your exam code in the box below (full code), and also encode it on the left (only the number). For example, if your code is AB0037 you should fill in 0 in the first column, 0 in the second, 3 in the third and 7 in the fourth.

Full exam code:

.....

Question 1: A B C D E

Question 2: A B C D E

Question 3: A B C D E F

Question 4: A B C

Question 5: A B ■ D E F

Question 6: A B C D E F ■

Question 7: A B C ■

Question 8: A B ■ D

Question 9: A B ■ D E F G

Question 10: ■■■■■■■■■■■■■■■

Question 11: A B C ■ E F G

Question 12: A B C D E ■ G

Question 13: A B C D ■ F G

Question 14: A B C D E F ■

Question 15: A B C D E F ■

Question 16: A B ■ D E F G

Question 17: A B C D ■ F G

Question 18: A B C ■ E F G

Question 19: A B C ■ E F

Question 20: A B ■ D E F

Question 21: A B ■ D E

Question 22: A B ■ D E F

Question 23: A ■ C D E F G

Question 24: ■ B C D E

Question 25: A B C D E F ■