CSE 344 Final Examination

June 8, 2011, 8:30am - 10:20am 아침에 시험보는 워싱턴 univ...

Name: _____

Question	Points	Score
1	20	
2	20	
3	30	
4	25	
5	35	
6	25	
7	20	
8	25	
Total:	200	

- This exam is a closed book exam.
- You have 1h:50 minutes; budget time carefully.
- Please read all questions carefully before answering them.
- Some questions are easier, others harder; if a question sounds hard, skip it and return later.
- Good luck!

5 Conceptual Design, Constraints, Views

5. (35 points)

   (a) (10 points) Consider a relation $R(A, B, C, D, E)$ that satisfies the following functional dependencies:

$$ABC \rightarrow D$$
$$E \rightarrow B$$
$$AD \rightarrow C$$

Decompose the schema in BCNF. Show all your steps.
Answer (Show the steps leading to the BCNF decomposition):

R(A,B,C,D,E) table

$(ABC)^+ = ABCD$

$\therefore R_1(A,B,C,D) \quad R_2(A,B,C,E)$

$R_1(A,B,C,D)$ table

$(AD)^+ = ADC$

$\therefore R_3(A,C,D) \quad R_4(A,B,D)$

$R_2(A,B,C,E)$ table

$(E)^+ = B$

$\therefore R_5(B,E) \quad R_6(A,C,E)$

(c) (10 points) Consider the table below:

A	B	C
a_1	b_1	c_1
a_1	b_2	c_2
a_2	b_3	c_1
a_2	b_3	c_2

For each of the functional dependencies listed below, indicate whether it holds or not. If it holds, write OK. If it does not hold, indicate two tuples in the table above that violate the functional dependency. Refer to the tuples as 1,2,3,4; for example, you may say that $A \to C$ fails because of the tuples 3,4.

FD	Holds ?
$B \to A$	ok
$C \to A$	fail tuple 1,3
$A \to B$	fail tuple 1,2
$C \to B$	fail tuple 1,3
$A \to C$	fail tuple 1,2
$B \to C$	fail tuple 3,4
$BC \to A$	ok
$AC \to B$	ok
$AB \to C$	fail tuple 3,4

$(b_1, c_1) \to a_1$
$(b_2, c_2) \to a_1$

(d) (10 points) Consider two relations `R(A,B)`, `S(C,D,E)`, with the following functional dependencies. In R: $A \rightarrow B$. In S: $C \rightarrow D$. Consider the following view definition:

```
create view V as
  select distinct R.A, R.B, S.D, S.E
  from R, S
  where R.B=S.C and S.E=55
```

For each of the following functional dependencies below, indicate whether they hold in the view $V(A, B, D, E)$:

1. $A \rightarrow D$.

   True or false ?

   (d) true

2. $E \rightarrow B$.

   True or false ?

   (d) false

3. $A \rightarrow E$. → 포함기 때문

   True or false ?

   (d) true

4. $D \rightarrow A$.

   True or false ?

   (d) false

CSE 344 Final Examination

March 14, 2012, 8:30am - 10:20am

Name: _____

Question	Points	Score
1	60	
2	20	
3	40	
4	50	
5	30	
Total:	200	

- This exam is a closed book exam.
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- Good luck!

(b) (10 points) Answer the following questions.

i. What is an update anomaly? Choose one of the following:

(a) One transaction reads an element that was updated by an earlier, uncommitted transaction.

(b) The application wants to update a foreign key to a new value that does not exists in the referenced relation.

(c) The same information is stored redundantly in the database, and only some, but not all copies are updated.

i. _____

Answer (a), (b), or (c).

ii. Every relational schema in SQL is in 1st normal form.

ii. _____

True or false?

iii. Every XML data is in 1st normal form.

iii. _____

True or false?

iv. Which of the following statements best describes the main reason for representing a relational database in 1st normal form?

(a) To achieve physical data independence.

(b) To remove data anomalies (insertion, update, deletion anomalies).

(c) To save space on disk.

iv. a

Answer (a), (b), or (c).

v. Which of the following statements best describes the main reason for representing a relational database in BCNF?

(a) To achieve physical data independence.

(b) To remove data anomalies (insertion, update, deletion anomalies).

(c) To save space on disk.

v. b

Answer (a), (b), or (c).

(c) (10 points) Consider the following instance of a relation $R(A, B, C, D)$:

A	B	C	D
a	b	c	d
a'	b	c'	d
a'	b'	c	d'

For each of the following statements indicate whether it is true or false:

i. A is a key.

True or false?

i. false

ii. B is a key.

True or false?

ii. false

iii. AB is a key.

True or false?

iii. true

iv. BD is a key.

True or false?

iv. false

v. The functional dependency $A \rightarrow B$ holds.

True or false?

v. false

vi. The functional dependency $B \rightarrow D$ holds.

True or false?

vi. true

vii. $D+ = BD$ holds.

(d,d') =

True or false?

vii. true

(d) (10 points) Consider two relations $R(A, B, C, D)$ and $S(A, B, C, D)$, with the following functional dependencies:

R : $A \rightarrow BCD$
$B \rightarrow ACD$

S : $BC \rightarrow AD$
$D \rightarrow B$

i. Find all keys in R.

The keys are:

i. A, B

ii. Find all keys in S.

DBC

The keys are:

ii. BC, DC

iii. Find all keys in $R \cap S$.

The keys are:

iii. A, B, CD

iv. Assume that the relations $R(A, B, C, D)$ and $S(A, B, C, D)$ do not have any common values. That is, the values of the attribute $R.A$ are distinct from those of the attribute $S.A$, and the same for the attributes B, C, D. Find all keys in $R \cup S$

iv. _____

The keys are:

CSE 344 Final Examination

December 12, 2012, 8:30am - 10:20am

Name: _____

Question	Points	Score
1	30	
2	20	
3	30	
4	20	
Total:	100	

- This exam is open book and open notes but NO laptops or other portable devices.
- You have 1h:50 minutes; budget time carefully.
- Please read all questions carefully before answering them.
- Some questions are easier, others harder; if a question sounds hard, skip it and return later.
- Good luck!

(c) (10 points) Consider the following relational schema and set of functional dependencies.

R(A,B,C,D,E,F,G) with functional dependencies:

A → D
D → C
F → EG
DC → BF

Decompose R into BCNF. Show your work for partial credit. Your answer should consist of a list of table names and attributes and an indication of the keys in each table (underlined attributes).

Answer (Decompose R into BCNF):

$A^+ = A,D,C,BF,EG$ (BCNF O)

$D^+ = D,C,B,F,EG$ (BCNF X)

$R_1 = (B\ C\ D\ E\ F\ G)$ $R_2 = (A\ B\ D\ E\ F\ G)$

A → D 종속성 유지
∴ $R_2 = (A,D)$
BCNF 만족

R_1 table

$F^+ = EFG$

$R_3 = (E\ \underline{F}\ G)$ $R_4 = (B\ C\ \underline{D}\ F)$

BCNF만족

+ $R(A,B,C,D,E)$

$A \to B$

$C \to B$

$DE \to C$

$A^+ = AB$

$R_1 = (A,B)$ $R_2 = (A,C,D,E)$

R_2 table

$DE^+ = C,D,E$

$R_3 = (C,D,E)$ $R_4 = (A,D,E)$

<3NF 변환>

R(ABCDE)

F: {A→C, B→DE, D→C}

$A^+ = AC$

$B^+ = BCDE$

$D^+ = C$

$AB^+ = ABCDE$ → candidate key

A→C ∴ $R_1(AC)$ $R_2(A, B, D, E)$

in R_2

B→DE

$B^+ = BCDE$ ∴ $R_3(BCDE)$ $R_4(A, B)$

in R_3

D→C

$D^+ = C$ ∴ $R_4(DC)$ $R_5(BDE)$