

Database Management Systems (COP 5725)

(Spring 2018)

Instructor: Dr. Markus Schneider

TA: Matin Kheirkhahan

Homework 5

Name:	Srikanth Jammy
UFID:	1491-1388
Email Address:	jammy.srikanth@ufl.edu

Pledge (Must be signed according to UF Honor Code)

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

J. Srikanth

Signature

For scoring use only:

	Maximum	Received
Exercise 1	20	
Exercise 2	20	
Exercise 3	25	
Exercise 4	15	
Exercise 5	20	
Total	100	

Q1)

1.1) 1 NF

Customer ID	Customer name	Item	Shipping Address	Newsletter	Supplier	Supplier Phone	Price
1	John Smith	Xbox One	15 Main St, Pasadena	Xbox News	Microsoft	(808) BUY-XBOX	250
2	Roger Hicks	PS4	47 SW 13 th , Gainesville	PlayStation News	Sony	(808) BUY-SONY	300
3	Paul Kerbatian	Xbox One	28 Bellevue Av, Seattle	Xbox News	Microsoft	(808) BUY-XBOX	250
3	Paul Kerbatian	PS Villa	28 Bellevue Av, Seattle	PlayStation News	Sony	(808) BUY-SONY	300
4	John Smith	PS4	47 SW 13 th , Gainesville	PlayStation News	Sony	(808) BUY-SONY	300

1.2) 2NF

<u>CustomerID</u>	<u>CustomerName</u>	<u>ShippingAddress</u>
1	John Smith	15 Main St, Pasadena
2	Roger Hicks	47 SW 13 th , Gainesville
3	Paul Kerbatian	28 Bellevue Av, Seattle
4	John Smith	47 SW 13 th , Gainesville

Item table:

<u>Item</u>	<u>Supplier</u>	<u>SupplierPhone</u>	<u>Price</u>	<u>Newsletter</u>
Xbox One	Microsoft	(808) BUY-XBOX	250	Xbox News
PS4	Sony	(808) BUY-SONY	300	PlayStation News
PS Vita	Sony	(808) BUY-SONY	200	PlayStation News

Customer-Item mapping:

<u>CustomerID</u>	<u>Item</u>
1	Xbox One
2	PS4
3	Xbox One
3	PS Vita
4	PS4

Q 1.3) 3 NF

<u>Customer ID</u>	<u>Customer</u>	<u>Shipping Address</u>
1	John Smith	15 Main St, Pasadena
2	Roger Hicks	47 SW 13th, Gainesville
3	Paul Kerbatian	28 Bellevue Av, Seattle
4	John Smith	47 SW 13th, Gainesville

<u>ItemID</u>	Item	Supplier	Supplier Phone	Price
1	Xbox One	Microsoft	(808) BUY-XBOX	250
2	PS 4	Sony	(808) BUY-SONY	300
3	Xbox One	Wholesale	Toll Free	450
4	PS Vita	Wholesale	Toll Free	450

<u>Customer ID</u>	<u>ItemID</u>
1	1
2	2
3	3
3	4
4	2

Q.2

2.1

Given $\{AB \rightarrow C, C \rightarrow D, B \rightarrow E\}$

I	L	B	R
-	AB	C	DE

$AB^+ = \{A, B, C, D, E\}$ hence AB is the candidate key

in $B \rightarrow E$, E is partially dependent on candidate key

R is not in 2NF.

we can decompose R into R_1, R_2 such that they will be

in 2NF

$R_1(ABCD)$ with FD₁ $\{AB \rightarrow C, C \rightarrow D\}$

$R_2(BE)$ with FD₂ $\{B \rightarrow E\}$

Now, R_1, R_2 are in 2NF

2.2

Given: $\{A \rightarrow BCDEF, BC \rightarrow ADE, D \rightarrow E\}$

I	L	B	R
-	-	A, B, C D,	E

$$A^+ = \{A, B, C, D, E\}$$

$$BC^+ = \{AB, C, D, E\}$$

Both A, BC are candidate keys

D, E non prime attributes have full dependencies on candidate key hence R is in 2NF

From, $BC \rightarrow D$ and $D \rightarrow E$ creates a transitive dependence

Hence R is not in 3NF

Applying 3NF Synthesis algorithm on R

Step 4:- Find minimal cover of R

$$F_C: \{A \rightarrow BC, BC \rightarrow AD, D \rightarrow E\}$$

$$R_1(A, B, C) \quad R_2(B, C, A, D) \quad R_3(D, E)$$

since R_2 contains R_1 , so R_1 can be removed

$$R_1(A, B, C, D) \text{ with } FD_1 = \{A \rightarrow BC, BC \rightarrow AD\}$$

$$R_2(D, E) \text{ with } FD_2 = \{D \rightarrow E\}$$

NOW, R_1, R_2 in 3NF

2.3

Given $\{A \rightarrow BC, AD \rightarrow E, B \rightarrow C\}$

I	L	B	R
-	AD	B	CE

$AD^+ = \{A, B, C, D, E\}$ hence AD is the candidate key

Check 1NF: all the attributes are atomic R is in 1NF.

Check R is in 2NF:

in $A \rightarrow BC$ given $A \rightarrow B$, $A \rightarrow C$, since non prime attributes are partially dependent on candidate key R is not in 2NF.

$R_1(ABC)$ with FD₁ { $A \rightarrow BC$, $B \rightarrow C$ }

$R_2(ADE)$ with FD₂ { $AD \rightarrow E$ }

R_1 is not in 3NF since $A \rightarrow B$, $B \rightarrow C$ is a transitive relation.

decompose R_1 into ~~into~~ R_1' and R_2''

$R_1'(AB)$ with FD { $A \rightarrow B$ }

, $R_2''(BC)$ with FD { $B \rightarrow C$ }

so finally R is in 3NF with

$R_1(AB)$ with FD₁ { $A \rightarrow B$ }

$R_2(BC)$ with FD₂ { $B \rightarrow C$ }

$R_3(ADE)$ with FD₃ { $AD \rightarrow E$ }

R is also in BCNF after decomposition into R_1, R_2 .

Exercise 3

3.1)

Initial Mapping:

a	b	c1	d1	e1	f1
a2	b	c	d2	e2	f2
a	b	c3	d	e	f3
a4	b4	c4	d4	e	f

Transforming using E -> F:

a	b	c1	d1	e1	f1
a2	b	c	d2	e2	f2
a	b	c3	d	e	f
a4	b4	c4	d4	e	f

Transforming using B -> D:

a	b	c1	d	e1	f1
a2	b	c	d	e2	f2
a	b	c3	d	e	f
a4	b4	c4	d4	e	f

Transforming using AD -> E:

a	b	c1	d	e	f1
a2	b	c	d	e2	f2
a	b	c3	d	e	f
a4	b4	c4	d4	e	f

Transforming using AB \rightarrow C:

a	b	c1	d	e	f1
a2	b	c	d	e2	f2
a	b	c1	d	e	f
a4	b4	c4	d4	e	f

Transforming using E \rightarrow F:

a	b	c1	d	e	f
a2	b	c	d	e2	f2
a	b	c1	d	e	f
a4	b4	c4	d4	e	f

Since, There is no row with abcdef as value hence he decomposition is not lossless

Checking for dependency preserving:

In R1(AB),

we do not have any FD that has relation between on A and B. (We only have Trivial FD's i.e AB \rightarrow AB)

AB⁺ = ABC (C is not present in R1)

Therefore, F1 = \emptyset

In R2(BC),

we do not have any FD that has relation between on B and C. (We only have Trivial FD's i.e BC \rightarrow BC)

BC⁺ = ABC (A is not present in R2)

Therefore, F2 = \emptyset

In R3(ABDE),

B⁺ = BD

F3 = B \rightarrow D (contained)

AD⁺ = ADE

Therefore F3 = {B \rightarrow D, AD \rightarrow E}

In R4(EF),

E⁺ = EF

Therefore F4 = {E \rightarrow F}

F_r = F1 \cup F2 \cup F3 \cup F4 = { B \rightarrow D, AD \rightarrow E, E \rightarrow F }

But it doesn't cover $AB \rightarrow c$, $AC \rightarrow B$, $BC \rightarrow A$.
 Therefore its not dependency preserving.

3.2.a.)

$R1(BCD)$, $R2(ACE)$

$$R1 \cap R2 = \{C\}$$

$$R1 = \{B, C, D\} \text{ or } R2 = \{A, C, E\}$$

$$F = \{AB \rightarrow C, C \rightarrow E, B \rightarrow D, E \rightarrow A\}$$

Applying union rule on $C \rightarrow E$ and $E \rightarrow A \Rightarrow C \rightarrow ACE$

$$(R1 \cap R2) \rightarrow (R2)$$

$C \rightarrow AE$ belongs to F^+

Hence, the decomposition of R into $R1$ and $R2$ is lossless.

3.2.b. And 3.2.c)

$A \rightarrow CD$, $B \rightarrow CE$, $E \rightarrow B$

I	L	B	R
	A	B,E	C,D

$A \rightarrow CD$ which is not equal to R .

Augmenting with B

$AB \rightarrow BCD$ from $B \rightarrow CE$ and $AB \rightarrow BCD$

Candidate keys $AB \rightarrow ABCDE$ (A combining with B),
 $AE \rightarrow ABCDE$ (A with E)

Non prime attributes are C,D

R is not in 2NF. $A \rightarrow C$ from $A \rightarrow CD$ and $A \rightarrow D$

Decomposition of R :

$F = \{A \rightarrow CD, B \rightarrow CE, E \rightarrow B\}$

Compute $F_C = \{A \rightarrow CD, B \rightarrow CE, AE \rightarrow B\}$

Decomposing gives $R_1(ACD) : \{A \rightarrow CD\}, R_2(BCE) : \{B \rightarrow CE\}$

Each R_1, R_2 are in BCNF now.

Q5)

1)

Alter table takes

Add constraint fk

Foreign key(student_no, course_no) references (student(stno), course(cno))

On delete cascade;

2)

Alter table student add constraint pk primarykey(stno);

Alter table course add constraint ckey primarykey(crno);

Alter table student add constraint unique_email Unique(email);

Alter table takes add constraint takes_grade check (takes.grade <= 4);

Alter table course add constraint course_credit check (course.credit <9);

3) create trigger answer

Before insert on takes

Referencing new row as newrow

For each row

when(newrow.course_no = course_no)

Begin

Select avg(grades) from takes group by course_no;

End;

4)

Create trigger answer

After insert, update on takes

Referencing new row as newrow

For each row

Begin

Insert into student_log (ID, Student_No, course_no, time)

values ((select max(ID) from student_log)+1, newrow.student_no, newrow.course_no, current_timestamp);

End;