Homework 3

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CECS 535: Introduction to Databases

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1 Given relation R(A, B, C, D, E, F) give the key(s) of R and the normal form of R if the FDs are

1.1

AB -> CD

C -> E

D -> F

i. Keys: (A, B)
ii. Normal Form: 2NF

1.2

A -> BCD

D -> EF

i. Keys: A
ii. Normal Form: 2NF

1.3

A -> BC

D -> EF

i. Keys: (A, D)
ii. Normal Form: 3NF

1.4

AB -> C

CD -> EF

i. Keys: (A, B, D)
ii. Normal Form: 3NF

1.5

AB -> CD

D -> EF

C -> AB

i. Keys: (A, B, C)
ii. Normal Form: 2NF

1.6

ABC -> D

ABC -> E

ABC -> F

i. Keys: (A, B, C)
ii. Normal Form: 3NF

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2. Consider the following table and FDs
ACTIVITY(customerid,fname,lname,address,zip,status,partid,date,price,quantity,material,color)

customerid → fname,lname,address
address → zip
partid → price,material,color
customerid,partid → date,quantity,status

2.1 GIVE ALL THE KEYS OF ACTIVITY

(customerid, partid)

2.2 DECOMPOSE ACTIVITY INTO 3NF RELATIONS. MAKE SURE THE DECOMPOSITION IS LOSSLESS.

2.2.1 Relations

CUSTOMER_PART_ID(customerid, partid, date, quantity, status)

CUSTOMER(customerid, fname, lname)

CUSTOMER_ADDRESS(address, zip)

PART(partid, price, material, color)

2.2.2 Dependencies

customerid, partid -> date, quantity, status

customerid -> fname, lname, address

address -> zip

partid -> price, material, color

Consider the following table and FDs

COMPLAINT(customer-id,product-id,date,time,color,size,name,address,zip)

customer-id → name,address
address → zip
product-id → color,size
customer-id,product-id → date,time

Given the following decompositions, determine if lossless join holds (note: use the matrix method to give the answer; no points are given for a yes/no answer alone, even if correct).

- COMPLAINT1(customer-id,name,adress,zip), COMPLAINT2(product-id,color,size), COMPLAINT3(customer-id,product-id,date,time).

- COMPLAINT1(customer-id,name,adress), COMPLAINT2(customer-id,zip), COMPLAINT3(product-id,color,size,customer-id,date,time).

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3.1

	customer-id	product-id	date	time	color	size	name	address	zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	A9
C2	B21	A2	B23	B24	A5	A6	B27	B28	B29
C3	A1	A2	A3	A4	B35	B36	B37	B38	B39

3.1.1 TRY customer-id -> name,address

A1 -> B37 A7

A1 -> B38 A8

	customer-id	product-id	date	time	color	size	name	address	zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	A9
C2	B21	A2	B23	B24	A5	A6	B27	B28	B29
C3	A1	A2	A3	A4	B35	B36	**A7**	**A8**	B39

3.1.2 TRY address -> zip

A8 -> B39 A9

	customer-id	product-id	date	time	color	size	name	address	zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	A9
C2	B21	A2	B23	B24	A5	A6	B27	B28	B29
C3	A1	A2	A3	A4	B35	B36	A7	A8	**A9**

3.1.3 TRY product-id -> color,size

A2 -> B35 A5

A2 -> B36 A6

	customer-id	product-id	date	time	color	size	name	address	zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	A9
C2	B21	A2	B23	B24	A5	A6	B27	B28	B29
C3	A1	A2	A3	A4	**A5**	**A6**	A7	A8	A9

Since the final row is filled with Ai values, the decomposition has the lossless join property.

3.2

	customer-id	product-id	date	time	color	size	name	address	zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	B19
C2	A1	B22	B23	B24	B25	B26	B27	B28	A9
C3	A1	A2	A3	A4	A5	A6	B37	B38	B39

3.2.1 TRY customer-id -> name,address

A1 -> B37 A7

A1 -> B38 A8

	customer-id	product-id	date	time	color	size	name	address	Zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	B19
C2	A1	B22	B23	B24	B25	B26	A7	A8	A9
C3	A1	A2	A3	A4	A5	A6	**A7**	**A8**	B39

3.2.2 TRY address -> zip

A8 -> B39 A9

	customer-id	product-id	date	time	color	size	name	address	Zip
C1	A1	B12	B13	B14	B15	B16	A7	A8	B19
C2	A1	B22	B23	B24	B25	B26	A7	A8	A9
C3	A1	A2	A3	A4	A5	A6	A7	A8	**A9**

Since the final row is filled with Ai values, the decomposition has the lossless join property.

4. Consider the following table and FDs

PRODUCT(pid,pname,price,pmfr,warehouse-origin,discount,type)

pid → pname,pmfr,type
pmfr,pname → warehouse-origin,discount
pmfr,type → price
pmfr,pname,type → pid

(a) Give *all* the keys of PRODUCT.

4 (b) Decompose PRODUCT into 3NF relations. Make sure the decomposition is lossless.

4.1 KEYS: PID

4.2 DECOMPOSE PRODUCT INTO 3NF RELATIONS. MAKE SURE THE DECOMPOSITION IS LOSSLESS.

4.2.1 Relations

PRODUCT(pid, pname, pmfr, type)

PRODUCT_MANUFACTURE(pmfr, pname, warehouse-origin, discount)

MANUFACTURE_PRICE(pmfr, type, price)

4.2.2 Dependencies

pid -> pname, pmfr, type

pmfr, pname -> warehouse-origin, discount

pmfr, type -> price

5. Consider the following table and FDs:

RENTAL(tool-id,toolname,client-id,address,day,price,length-rental)

tool-id → toolname
client-id → address
tool-id,client-id → price
tool-id,client-id,day → length-rental

(a) Give *all* the keys of RENTAL.
(b) Decompose RENTAL into 3NF relations. Make sure the decomposition is lossless.

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5.1 KEYS: (TOOL-ID, CLIENT-ID, DAY)

5.2 DECOMPOSE RENTAL INTO 3NF RELATIONS. MAKE SURE THE DECOMPOSITION IS LOSSLESS.

5.2.1 Relations

TOOL(tool-id, toolname)

CLIENT(client-id, address)

TOOL_CLIENT_PRICE(tool-id, client-id, price)

TOOL_CLIENT_DAY_RENTAL(tool-id, client-id, day, length-rental)

5.2.2 Dependencies

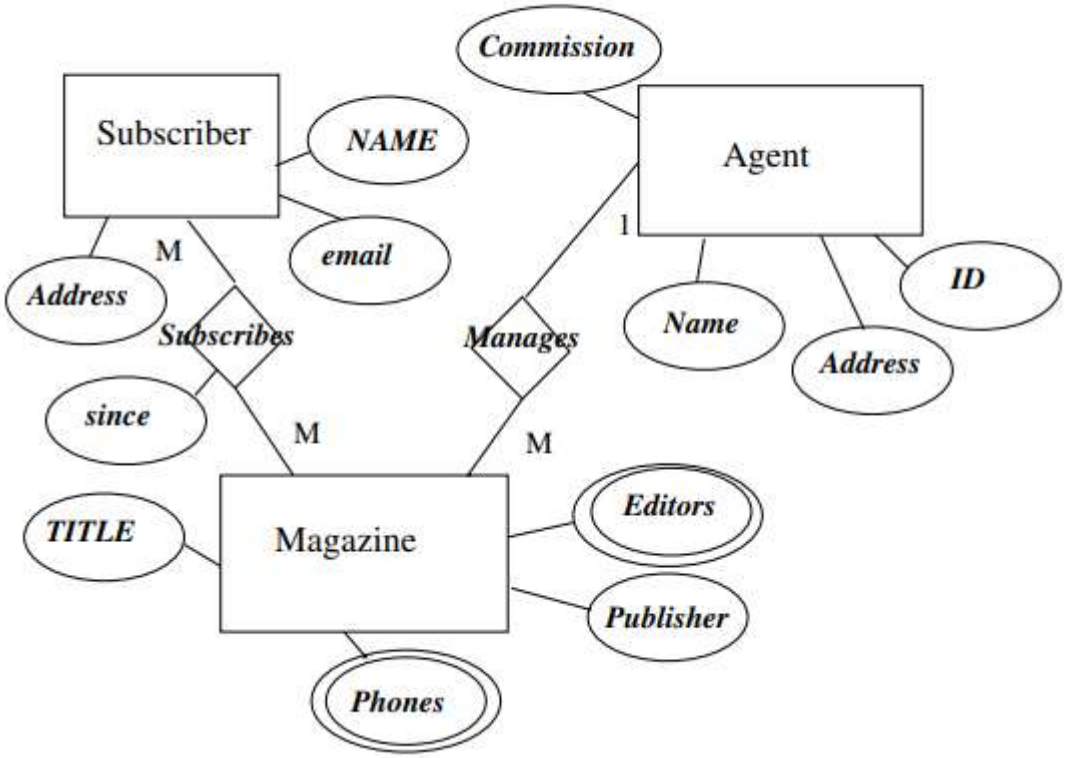
tool-id -> toolname

client-id ->address

tool-id, client-id -> price

tool-id, client-id, day -> length-rental

6. Given the E-R diagram shown below, give a database schema (i.e. list of relations) for it. The diagram follows the textbook conventions for relations. Keys are in uppercase, multi-valued attributes in double-lined ellipses. **Make sure to give the keys for each relation (primary and foreign).**



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6.1 Relations

6.1.1 Subscriber(NAME, Address, email)

6.1.2 Subscribes(NAME, TITLE, since)

6.1.3 Agent(ID, Address, Name, Commission)

6.1.4 Manages(ID, TITLE)

6.1.5 Magazine(TITLE, Phones, Publisher, Editors)