CS 1555 HW 8

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Wednesday, Apr 1

1. (a) Primary Keys are ItemId and PurchaceId. These are the ones that do not appear on the left hand side

    I will find these using the universal relational approach.

    Using ItemId → ItemDescription,

    R1(<u>ItemId</u>, <u>PurchaceId</u>, PurchaceDate, VendorCode, VendorName, VendorAddress, OrderQuantity, ItemPrice, StockQuantity)

    R2(<u>ItemId</u>, ItemDescription)

    Using ItemId → ItemPrice

    R11(<u>ItemId</u>, <u>PurchaceId</u>, PurchaceDate, VendorCode, VendorName, VendorAddress, OrderQuantity, StockQuantity)

    R12(<u>ItemId</u>, ItemPrice)

    Using ItemId → StockQuantity

    R111(<u>ItemId</u>, <u>PurchaceId</u>, PurchaceDate, VendorCode, VendorName, VendorAddress, OrderQuantity)

    R112(<u>ItemId</u>, StockQuantity)

    Using PurchaceId → PurchaceDate

    R1111(<u>ItemId</u>, <u>PurchaceId</u>, VendorCode, VendorName, VendorAddress, OrderQuantity)

    R1112(<u>PurchaceId</u>, PurchaceDate)

    Using PurchaceId → VendorCode

    R11111(<u>ItemId</u>, <u>PurchaceId</u>, VendorName, VendorAddress, OrderQuantity)

    R11112(<u>PurchaceId</u>, VendorCode)

    Using VendorCode → VendorName

    R111111(<u>ItemId</u>, <u>PurchaceId</u>, VendorAddress, OrderQuantity)

    R111112(<u>VendorCode</u>, VendorName)

Using VendorCode → VendorAddress

    R1111111(<u>ItemId</u>, <u>PurchaceId</u>, OrderQuantity)

    R1111112(<u>VendorCode</u>, VendorAddress)

So, our relations are

R1(<u>ItemId</u>, <u>PurchaceID</u>, OrderQuantity)

R2(<u>VendorCode</u>, VendorName, VendorAddress)

R3(<u>PurchaceID</u>, PurchaceDate, VendorCode)

R4(<u>ItemId</u>, ItemDescription, ItemPrice, StockQuantity)

(b) This composition is good, because each table depends on the primary key and nothing but that key. The construction is indeed lossless, as R1 has access to old attributes.

	ItemId	ItemDesc	ItemPrice	StockQuantity	PurchaceId	PurchaceDate	VendorCode	VendorName	VendorAddress	OrderQuantity	
R1	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	
R2	U	U	U	U	U	U	A7	A8	A9	U	
R3	U	U	U	U	A5	A6	A7	A8	A9	U	
R4	A1	A2	A3	A4	U	U	U	U	U	U	

Table 1: This is the table to check for lossless join created by applying each functional decomp

2. (a) A → B

B → CD

A → D

B → C

AB → CD

A → C

E → F

Transform all FDs to canonical form

A → B

B → C

B → D

A → D

B → C

AB → C

AB → D

A → C

E → F

Remove Redudancies

A → B

B → C

B → D

A → D

B → C

AB → C

AB → D

A → C

E → F

Drop Extraneous attributes

A → B

B → C

B → D

E → F

Finding keys. A, E does not appear in right hand keys, so it must appear in all keys.

AE+ : AE → AEB → AEBC → AEBCDF

So key is AE.

Group FDs with same determinant

A → B

B → CD

E → F

Construct relation

R1 ($\underline{A}$, B)

R2 ($\underline{B}$, C, D)

R3 ($\underline{E}$, F)

If none of the relations contain the key for the original relation add a relation with the key.

R1 ($\underline{A}$, B)

R2 ($\underline{B}$, C, D)

R3 ($\underline{E}$, F)

R4 ($\underline{A}$, $\underline{E}$)

(b) This is lossless because it covers all attributes

	A	B	C	D	E	F
R1	A1	A2	A3	A4	U	U
R2	U	A2	A3	A4	U	U
R3	U	U	U	U	A5	A6
R4	A1	A2	A3	A4	A5	A6