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(ItemId, PurchaceId, PurchaceDate, VendorCode, VendorName, VendorAddress, OrderQuantity, ItemPrice, StockQuantity)

   R2(ItemId, ItemDescription)

   Using ItemId → ItemPrice

   R11(ItemId, PurchaceId, PurchaceDate, VendorCode, VendorName, VendorAddress, OrderQuantity, StockQuantity)

   R12(ItemId, ItemPrice)

   Using ItemId → StockQuantity

   R111(ItemId, PurchaceId, PurchaceDate, VendorCode, VendorName, VendorAddress, OrderQuantity)

   R112(ItemId, StockQuantity)

   Using PurchaceId → PurchaceDate

   R1111(ItemId, PurchaceId, VendorCode, VendorName, VendorAddress, OrderQuantity)

   R1112(PurchaceId, PurchaceDate)

   Using PurchaceId → VendorCode

   R11111(ItemId, PurchaceId, VendorName, VendorAddress, OrderQuantity)

   R11112(PurchaceId, VendorCode)

   Using VendorCode → VendorName

   R111111(ItemId, PurchaceId, VendorAddress, OrderQuantity)

   R111112(VendorCode, VendorName)

Using VendorCode → VendorAddress

R1111111(ItemId, PurchaceId, OrderQuantity)

R1111112(VendorCode, VendorAddress)

Using ItemId → OrderQuantity

R11111111(ItemId, PurchaceId)

R11111112(ItemId, OrderQuantity)

So, our relations are

R1(ItemId, PurchaceID)

R2(VendorCode, VendorName, VendorAddress)

R3(PurchaceID, PurchaceDate, VendorCode)

R4(ItemId, ItemDescription, ItemPrice, StockQuantity)

R5(ItemId, OrderQuantity)

(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 all 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	
R5	A1	A2	A3	A4	U	U	U	U	U	A10	

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

$AB \rightarrow C$
$AB \rightarrow D$
$A \rightarrow C$
$E \rightarrow F$

Remove Redudancies
$A \rightarrow B$
$B \rightarrow C$
$B \rightarrow D$
$A \rightarrow D$
$B \rightarrow C$
$AB \rightarrow C$
$AB \rightarrow D$
$A \rightarrow C$
$E \rightarrow F$

Drop Extraneous attributes
$A \rightarrow B$
$B \rightarrow C$
$B \rightarrow D$
$E \rightarrow F$

Finding keys. A, E does not appear in right hand keys, so it must appear in all keys.
AE+ : $AE \rightarrow AEB \rightarrow AEBC \rightarrow AEBCDF$
So key is AE.

Group FDs with same determinant
$A \rightarrow B$
$B \rightarrow CD$
$E \rightarrow F$

Construct relation
R1 (<u>A</u>, B)
R2 (<u>B</u>, C, D)
R3 (<u>E</u>, F)

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

R1 (A, B)
R2 (B, C, D)
R3 (E, F)
R4 (A, 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