

COMS 4111 Intro to DB HW3 - Part 2

Normalization

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Q2.1

Write answers here.

- a All the non-trivial functional dependencies in the closure that have only one attribute on the right side are: $B \rightarrow C, C \rightarrow A, B \rightarrow A$.
- b The minimal key of R is B.

Q2.2

Write answers here.

- a All the non-trivial functional dependencies in the closure that have only one attribute on the right side are: $AB \rightarrow D, BD \rightarrow C, CD \rightarrow A, AD \rightarrow B, AB \rightarrow C, BD \rightarrow A, AD \rightarrow C, CD \rightarrow B$.
- b The minimal keys of S are AB, or BD, or AD, or CD.

Q2.3

Write answers here. The keys in iowa are date, store, vendor_no, itemno, invoice_line_no.

Q2.4

Write answers here. For simplicity, we represent every attribute with one letter:

addree = A, bottle_volumn_ml = B, category = C, category_name = D, city = E, county = F, county_number = G, date = H, im_desc = I, invoice_line_no = J, itemno = K, name = L, pack = M, sale_bottles = N, sale_dollars = O, sale_gallons = P, sale_liters = Q, state_bottle_cost = R, state_bottle_retail = S, store = T, store_location_address = U, store_location_city = V, store_location_zip = W, vendor_name = X, vendor_no = Y, vendor_no = Z, store_location = α .

So the functional dependencies could be represented as: $T \rightarrow AEFGLUVWZ\alpha$, $Y \rightarrow X$, $C \rightarrow D$, $K \rightarrow BCIRS$, $HKJTY \rightarrow MNOPQ$.

And we could get the minimum cover: $F_{min} = \{T \rightarrow A, T \rightarrow E, T \rightarrow F, T \rightarrow G, T \rightarrow L, T \rightarrow U, T \rightarrow V, T \rightarrow W, T \rightarrow Z, T \rightarrow \alpha, Y \rightarrow X, C \rightarrow D, K \rightarrow B, K \rightarrow C, K \rightarrow I, K \rightarrow R, K \rightarrow S, HKJTY \rightarrow M, HKJTY \rightarrow N, HKJTY \rightarrow O, HKJTY \rightarrow P, HKJTY \rightarrow Q\}$.

Then we do the composition as following:

Applying 'Y \rightarrow X': 'YX', 'ABCDEFGHJKLMNOPQRSTUVWXYZ α '.

Applying 'C \rightarrow D': 'YX', 'CD', 'ABCEFGHJKLMNOPQRSTUVWXYZ α '.

Applying 'T \rightarrow AEFGLUVWZ α ': 'YX', 'CD', 'AEFGLTUVWZ α ', 'BCHJKLMNOPQRSTY'.

Applying 'K \rightarrow BCIRS': 'YX', 'CD', 'AEFGLTUVWZ α ', 'BCIKRS', 'HJKLMNOPQTY'.

Check the F_{min} , all functional dependencies are covered and no redundancy. So this is the 3NF decomposition for the table: 'YX', 'CD', 'AEFGLTUVWZ α ', 'BCIKRS', 'HJKLMNOPQTY'. Write in the name of attributes:

[vendor_name, vendor_no].

[category, category_name].

[addree, city, county, county_number, name, store, store_location_address, store_location_city, store_location_zip, zipcode, store_location].

[bottle_volumn_ml, category, im_desc, itemno, state_bottle_cost, state_bottle_retail].

[date, invoice_line_no, itemno, pack, sale_bottles, sale_dollars, sale_gallons, sale_liters, store, vendor_no].

Q2.5

Write answers here. Yes, my schema is free of redundancies and anomalies. All the sub-relations have been confirmed without redundancies. Moreover, it is a 3NF decomposition and there are no lost joins (original relation could be recovered from the join of the sub-relations) or lost dependencies (checked with F_{min}). So there is no anomalies.

Q2.6

Write answers here. No, I can't. Because function dependencies are about relationship between attributes, hence they could not be used to constrain the value of one certain column.

Q2.7

Write answers here.

a There is only one vendor_name value for itemno number '3326' in the iowa dataset.

- b Yes, it should be. Because the same product should have the same vendor. The relationship between item and vendor should be one to many.