

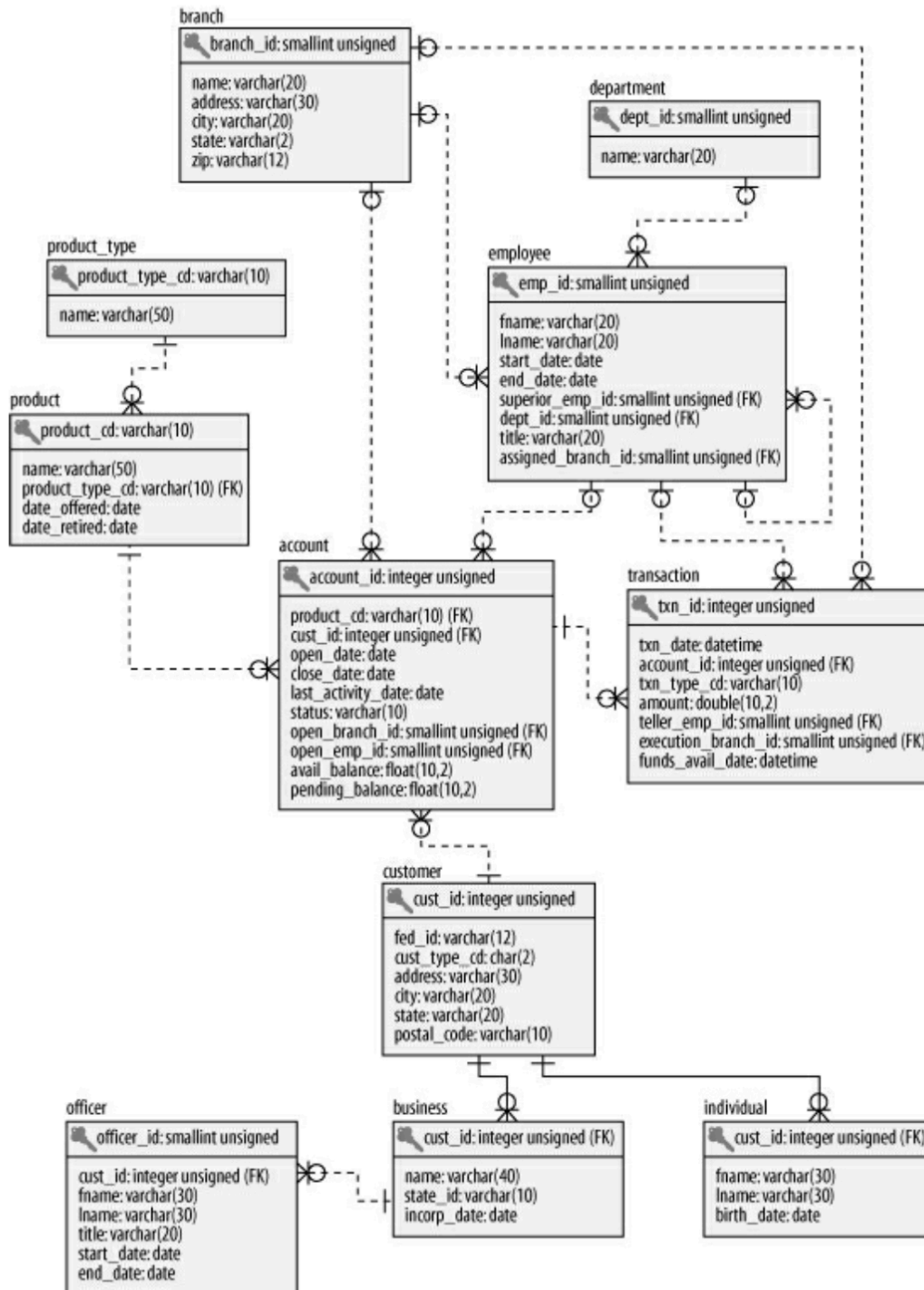
# Midterm Preparation 2023

## Problem 1:

Calculate the closures of all (non-trivial) subsets of attributes for the relation  $R(A,B,C,D)$  with four functional dependencies  $AB \rightarrow C$ ,  $AB \rightarrow D$ ,  $C \rightarrow A$ ,  $D \rightarrow B$ . Find the keys. Determine whether  $R$  is in Third, Boyce-Codd, or Fourth Normal Form.

## Problem 2:

The following is a ER diagram of a sample database. Implement the tables for employee, department, branch, account and transactions, using **all** reasonable constraints (including foreign keys)



### Problem 3:

Use the chase test to determine whether the decomposition of  $R(A, B, C, D, E)$  into  $S(A, B, C)$ ,  $T(B, C, D)$  and  $V(C, D, E)$  with FDs  $A, B \rightarrow C$ ,  $B \rightarrow D$ , and  $C, D \rightarrow E$  in  $R$  is a lossless decomposition?

### Problem 4:

**F**ind the names and credit limits of customers with a credit limit of 200,000 or more.

**W**hich customer made a payment of 7678.25?

**F**ind the names, city, and country of customers from Germany who are not in Berlin.

**F**ind the full names of all contacts at customers and of all employees.

**F**ind the customer name, order Number, order date and shipped date whenever the shipped date is more than 60 days after the ordered date.

**F**ind the full names of all contacts at customers and of all employees.

**F**ind the product name and the quantity ordered where 70 or more items are ordered in the same order. Order the result by the quantity ordered starting with the largest order.

**F**ind the name, country, and city of customers who ordered a model with "Gran Torino" in the product description.

**F**ind the names and countries of customers who did not make a payment in 2003.

**F**ind the number of customers who never had an order cancelled.