

COMP 231 Database Management Systems

Quiz 1

October 5, 2001 10:15 – 10:45

Name: _____ Student ID: _____

1. [60] The following is a simplified version of the relational schema from the lecture notes. It is further specified that an account or a loan cannot exist without having a customer associated with it. Primary keys of the relations are underlined.

customer (customer-name, customer-street, customer-city)

account (account-number, balance)

loan (loan-number, amount)

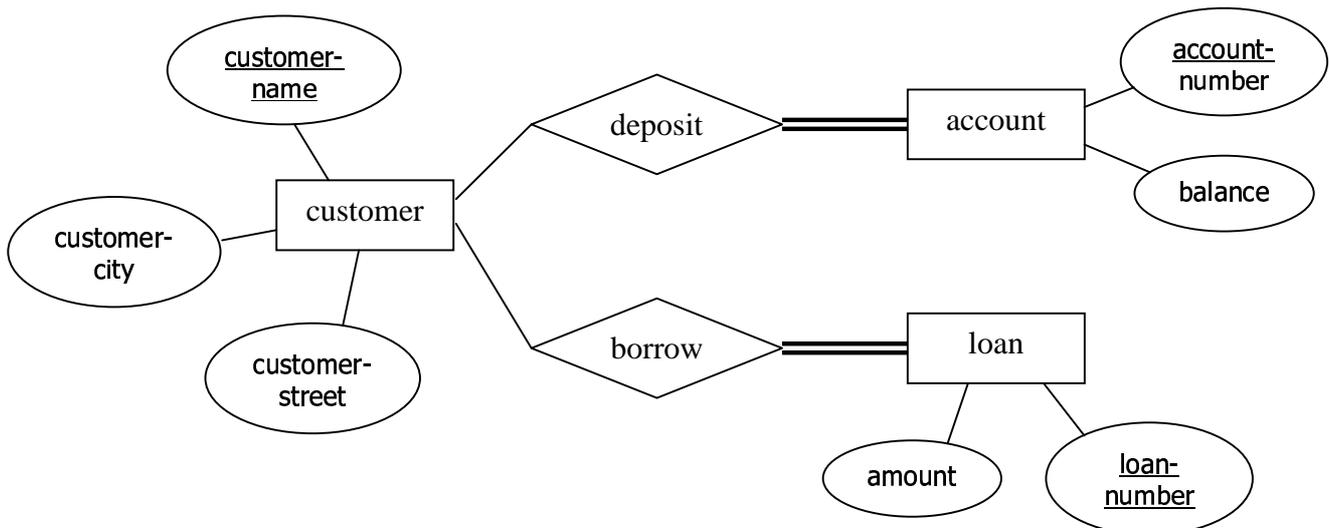
depositor (customer-name, account-number)

borrower (customer-name, loan-number)

Check in the following table whether the relation scheme represents an entity type, a relationship type, or both.

	Entity Type	Relationship Type	Both
customer	√		
account	√		
loan	√		
depositor		√	
borrower		√	

Draw the ER diagram corresponding to this relational schema. Indicate clearly the cardinalities of the relationships, existential constraints, if any, and the keys.



Note: both relationships are N:M. Both the textbook syntax and the min:max syntax are considered correct.

2. The **EMPLOYEE** relation records the employee numbers, employee names and the departments they work for. The **PROJECT** relation records the projects in the company, which include the project numbers, project names and the departments they belong to. Furthermore, **WORKS-ON** is a many-to-many relationship recording how many hours an employee had spent on a project.

EMPLOYEE (EmpNo, EmpName, DeptNo)
PROJECT (ProjNo, ProjName, DeptNo)
WORKS-ON (EmpNo, ProjNo, Hours)

Answer the following query using **BOTH** relational algebra and tuple relational calculus. For tuple relational calculus, you can use any of the two syntaxes covered in the lecture.

[40] Retrieve the names of all projects that “John Wong” works on.

$\Pi_{\text{ProjName}}(\sigma_{\text{EmpName}=\text{“John Wong”}}(\text{EMPLOYEE} \bowtie \text{WORKS-ON} \bowtie \text{PROJECT}))$

Here, the two joins are natural joins:

- The first join sets **EMPLOYEE.EmpNo = WORKS-ON. EmpNo**
- The second join sets **WORKS-ON.ProjNo=PROJECT.ProjNo**

$\{ p[\text{ProjName}] \mid p \in \text{PROJECT} \wedge (\exists w \in \text{WORKS-ON}) (w.\text{ProjNo}=p.\text{ProjNo} \wedge (\exists e \in \text{EMPLOYEE}) (e.\text{EmpName}=\text{“John Wong”} \wedge e.\text{EmpNo}=w.\text{EmpNo})) \}$