

**CSC370 – Database Systems**  
**Sections S01/S02**  
Spring 2004

*Midterm Examination – February 04th, 2004*

***Duration: 50 minutes***

- This exam is closed-book. No notes, books, calculators, or other assistance may be used.
- Write your answers in the exam booklet provided.
- Write your full name, full student ID, and signature on the exam booklet.
- State any assumptions you make.
- Show rough work.
- Ensure all cell phones are turned off.

**Question 1. Database Concepts [20 marks]**

- a) Define the term *relationship*.
- b) Define the term *relationship set*.
- c) Define the term *descriptive attributes*.
- d) What is a data model?
- e) Explain the advantages of using a query language instead of custom programs to process data.

**Question 2: Relational algebra [30 marks]**

Consider a schema with the following three tables:

ContactInfo (cname : string, address : string, balance : real)

Buyer (order : integer, bname : string, bitem : string)

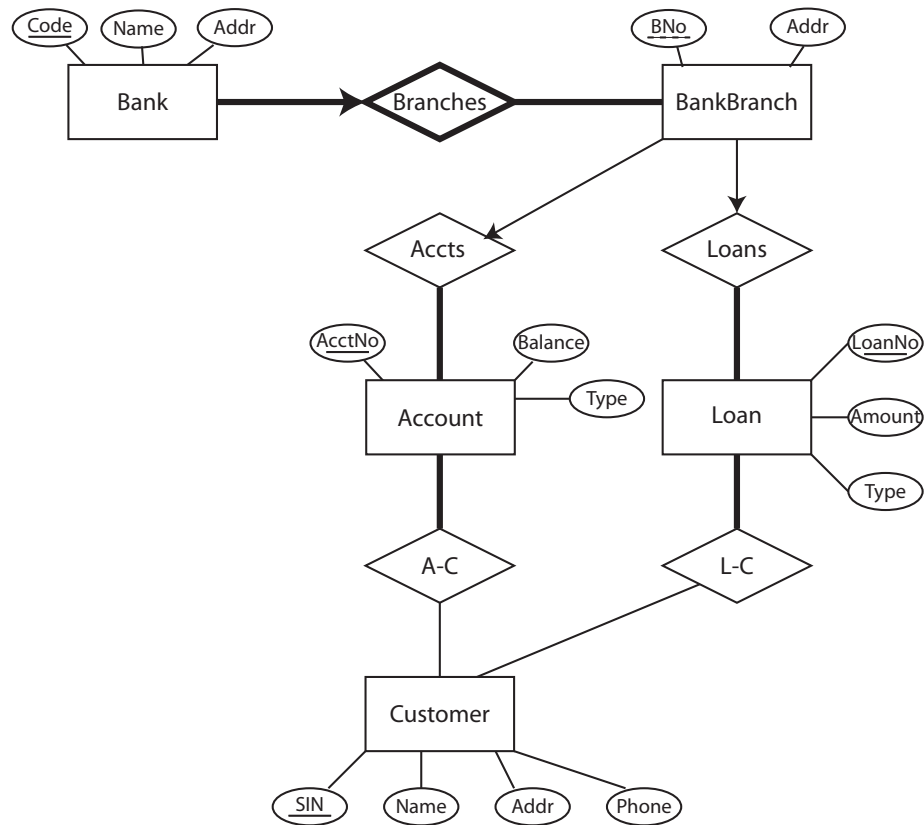
Product (pitem : string, cost : real, price : real)

Write relational algebra expressions for the following queries. You may not use logical conjunction, disjunction or negation in select statements. Break down your query into intermediate expressions by using the renaming operator.

- a) Find the names and addresses of all buyers who ordered product “Harry Putter”.
- b) Find all the products whose cost is greater than 5.00 and whose price is less than 7.00.
- c) Find the names and addresses of the buyers who have ordered every kind of product.

### Question 3. ER Diagrams – interpretation [30 marks]

Consider the following ER diagram:



- Provide CREATE TABLE statements for the A-C and L-C relationships along with CREATE TABLE statements for entities involved in these relationships. Choose appropriate data types for each field and explain how participation constraints would be handled.
- List concisely the user requirements that led to this ER schema diagram. Answer in point form.

### Question 4. ER diagrams – construction [20 marks]

Suppose that we have a ternary relationship R between entity sets A, B and C such that A has a key constraint and total participation and B has a key constraint; these are the only constraints. A has attributes  $a1$  and  $a2$  with  $a1$  being the key; B and C are similar. R has no descriptive attributes.

- Draw the ER diagram.
- Write SQL statements that create tables corresponding to this information so as to capture as many of the constraints as possible. If you cannot capture some constraint, explain why.