CST203-2

UVA WELLASSA UNIVERSITY

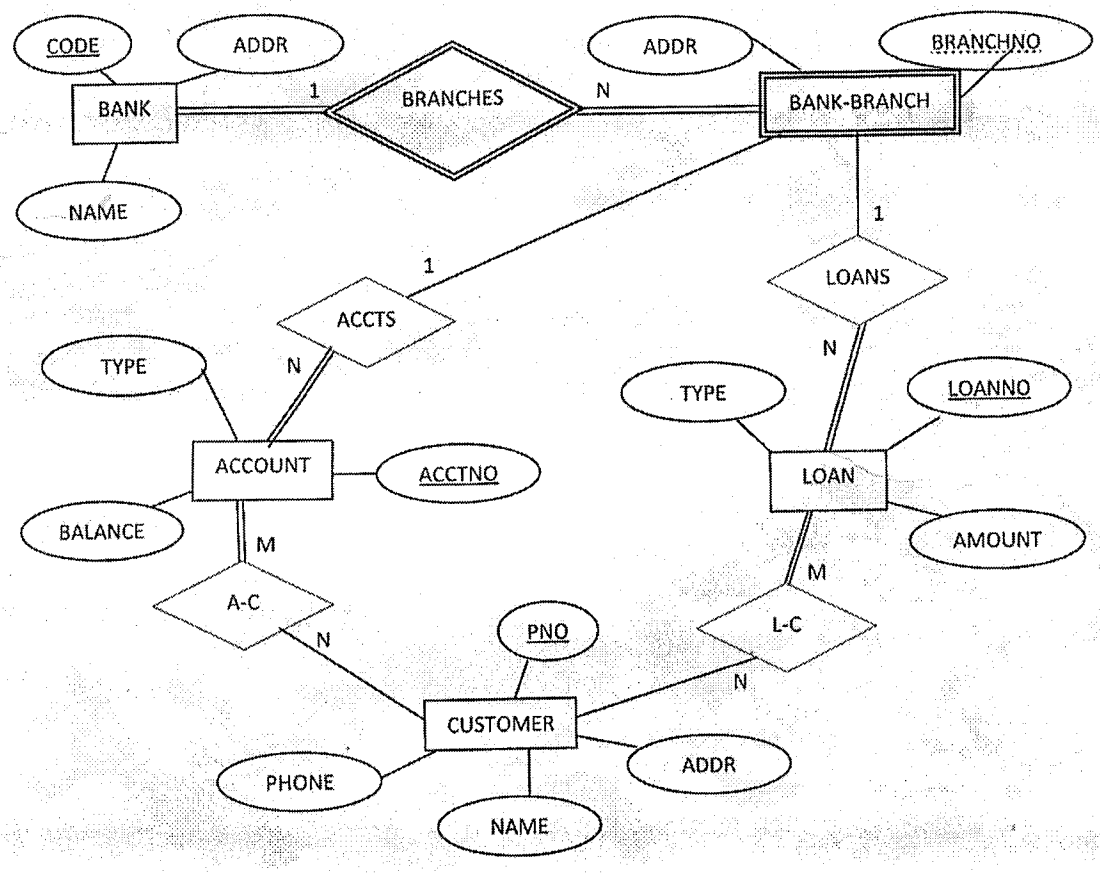
DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY

END SEMESTER EXAMINATION – SEMESTER I – 2007/2008

CST203-2 DATABASE MANAGEMENT SYSTEMS

Time Allowed: **TWO HOURS** Answer **All** Questions

1. Consider the ER diagram shown in the following figure for a part of a BANK database. Each bank can have multiple branches, and each branch can have multiple accounts and loans.



a. List the (non weak) entity types in the ER diagram
b. Is there a weak entity type? If so, give its name, partial key and identifying relationship
c. What constraints do the partial key and the identifying relationship of the weak entity type specify in the diagram?
d. List the names of all relationship types, and specify the (min, max) constraints on each participation of an entity type in a relationship type. Justify your choices.
e. Suppose that every customer must have at least one account but is restricted to at most two loans at a time, and that a bank branch cannot have more than 1000 loans. How does this show up on the (min, max) constraints. Use illustrations where necessary.

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2. Consider the following requirements for a University database that is used to keep track of students' transcripts.

   a. The University keeps track of each student's name, student number, current address and phone, permanent address and phone, DOB, sex, class (First year, Second year,...), major department, minor department (if any) and degree program (B.A, B.Sc.,...). Some user applications need to refer to the city, district, and postal code of the student's permanent address and to the student's last name. Both National identity card number and student number have unique values for each student.

   b. Each department is described by a name, department code, office number, office phone, and college. Both name and code have unique values for each department.

   c. Each course has a course name, description, course number, number of semester hours, level and offering department. The value of the course number id unique for each course.

   d. Each section has an instructor, semester, year, course and section number. The section number distinguishes sections of the same course that are taught during the same semester/year; its values are 1,2,3,..., up to the number of sections taught during each semester.

   e. A grade report has a student, section, letter grade and numeric grade (0,1,2,3 or 4).

   Design an ER schema for this application and draw an ER diagram for that schema. Specify key attributes of each entity type and structural constraints on each relationship type. Note any unspecified requirements and make appropriate assumptions to make the specification complete.

3. a Consider the following relation.

   CAR_SALE (Car#, Date_sold, Salesman#, Commission%, DiscountAmt)

   Assume that a car may be sold by multiple salesmen and hence {Car#, Salesman#} is the primary key. Additional dependencies are

   Date_slod → DiscountAmt and

   Salesman# → Commission%

   Based on the given primary key, is this relation in 1NF, 2NF or 3NF? Why or why not? How would you successively normalize it completely?

   b. Consider the following relation for published books.

   BOOK (BookTitle, AuthorName, BookType, ListPrice, AuthorAffil, Publisher)

   AuthorAffil refers to the affiliation of the author. Suppose the following dependancies exist.

   BookTitle → Publisher, BookType

   BookType → ListPrice

   AuthorName → AuthorAffil

   (i) What normal form is the relation in? Explain your answer.

   (ii) Apply normalization until you cannot decompose the relation further. State the reasons behind each decomposition.