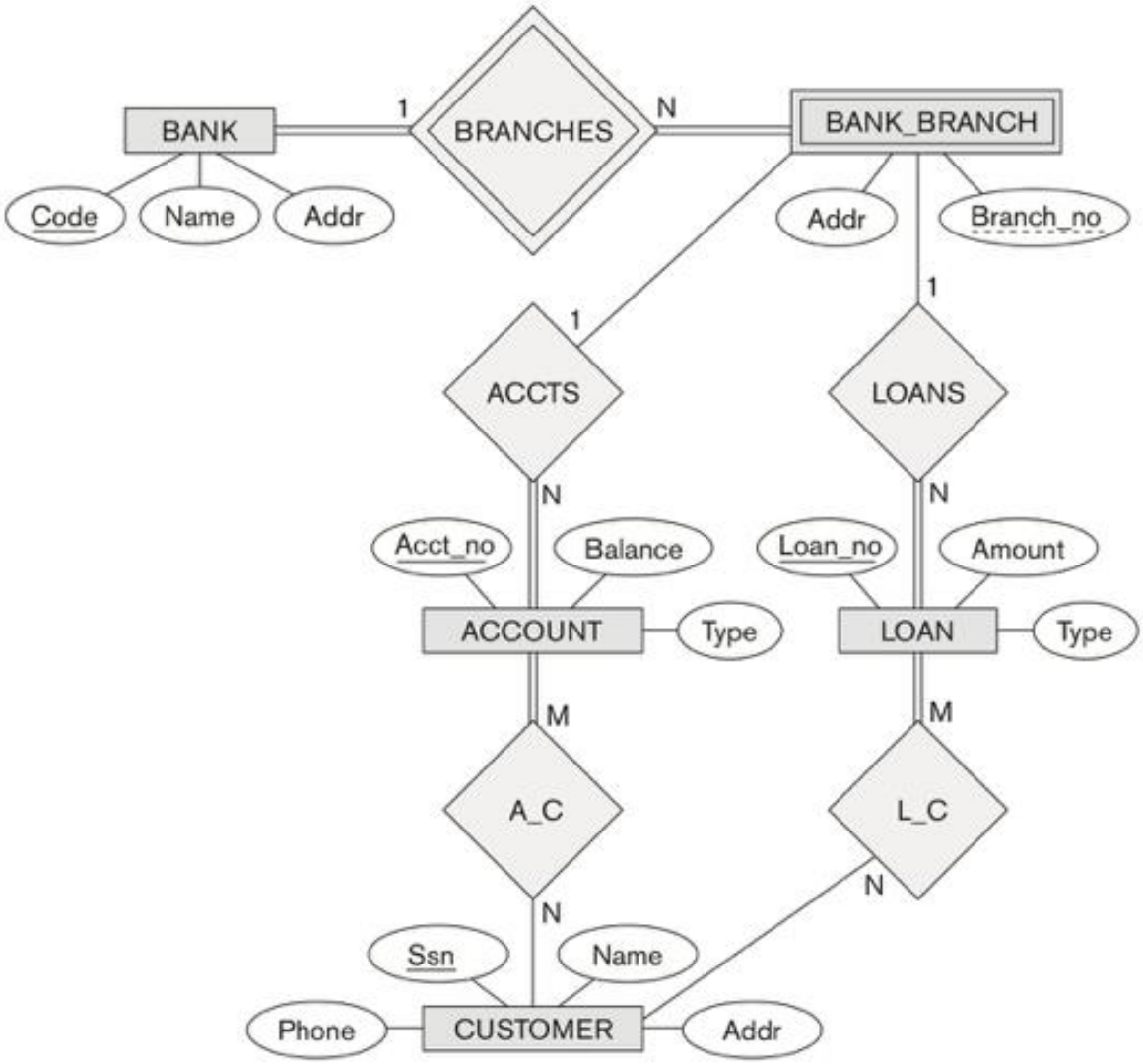
Database Systems Midterm - 2

1. [15 points] Consider the ER diagram shown in Figure below for part of a BANK database. Each bank can have multiple branches, and each branch can have multiple accounts and loans.

An ER diagram for a BANK database schema.



(a) List the strong (nonweak) entity types in the ER diagram.

(b) Is there a weak entity type? If so, give its name, its partial key, and its identifying relationship.

(c) What constraints do the partial key and the identifying relationship of the weak entity type specify in this diagram?

(d) List the names of all relationship types, and specify the (min, max) constraint on each participation of an entity type in a relationship type. Justify your choices.

2. [15 points] Given a relation R (U, V, W, X, Y), with a set of FD's, and a relation
   S (U, V, W), What FD's of R can be projected onto S. Give the FD's that hold in S if the FD's for R are: UV→ XY, W → Y, X → W, and Y→U.

3. [10 points] Consider a relation with schema U(A, B, C, D) and FD's A→ B, B→ C, C→D, and D→A. Find all keys and Superkeys for U.

4. [10 points] Let R (A, B, C, D, E) be decomposed into relations with the following three sets of attributes: {A, B, C}, {B, C, D}, and {A, C, E} and the set of FD's are { A→D, CD→ E, E→ D, AC→ E, B→ D }
   1. Use the chase test to tell whether the decomposition of R is lossless
   2. Are dependencies preserved by the decomposition?