

Department of Computer Science and Information Systems
CSF212 Database Systems
2nd Semester 2021-22
Mid-Semester Examination
(Closed Book Examination)

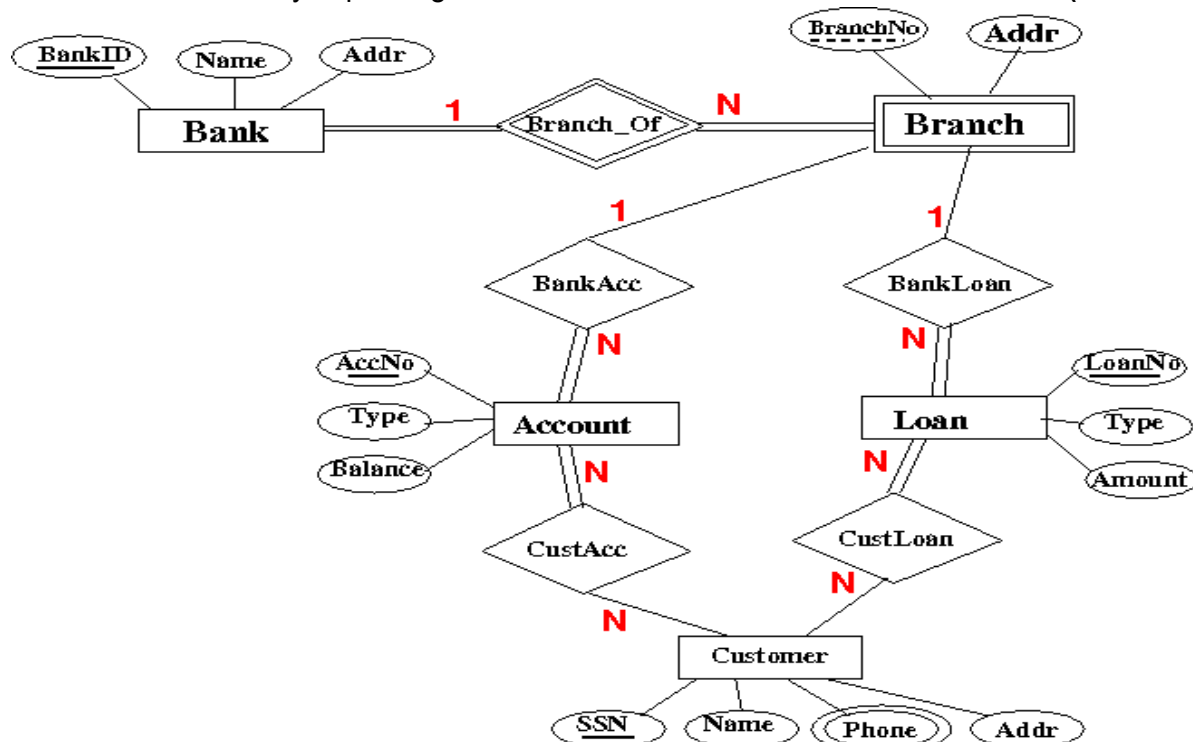
Maximum marks: 90

Time: 90 Minutes

Ques1. What do you understand by the term data model? Explain the difference between a data model and its implementation. Why is the difference important? How do you evaluate the designed model? **(10 Marks)**

Ques2. Answer the following

- a) Explain the following ER diagram in your own words. Discuss the relationships and the meaning you derive from them. **(10 Marks)**
- b) Convert the following ER model to a relational schema. Remove the redundancies after clearly explaining the redundancies. **(15 Marks)**



Ques3. Suppose you are given a relation grade points(grade, points) that provide conversion from

letter grades in the takes relation to numeric scores; for example, an “A” grade could be specified to correspond to 4 points, an “A–” to 3.7 points, a “B+” to 3.3 points, a “B” to 3 points, and so on.

The grade points earned by a student for a course offering (section) is defined as the number of credits for the course multiplied by the numeric points for the grade that the student received. Given the preceding relation and our university schema, write each of the following queries in

SQL and Relational Algebra. No tuple has the null value for a grade. Kindly specify the details you assumed that you feel necessary for writing the **SQL and Relational Algebra queries.**

- a) Find the total grade points earned by the student with ID '12345', across all courses taken by the student.
- b) Find the grade point average (GPA) for the above student, that is, the total grade points divided by the total credits for the associated courses.
- c) Find the ID and the grade-point average of each student.
- d) Now reconsider your answers to the earlier parts of this exercise under the assumption that some grades might be null. Explain whether your solutions still work and, if not, provide versions that handle nulls properly **(20 Marks)**

Ques4.

- a. How Multi-Valued Dependency differs from Functional Dependency? Explain with an example. What is Trivial Multi- Valued Dependency? What is the minimum condition to have a non trivial multi-valued dependency? **(10 Marks)**

- b. Given a Relation R (A,B,C,D,E) with following functional dependencies.

$A \rightarrow BC$

$CD \rightarrow E$

$B \rightarrow D$

$E \rightarrow A$

Find the Prime attributes. Normalize the following relational schema to 3NF. Suggest the step by step process starting from 1 NF. Your explanation is important in each step.

(10 Marks)

- c. Consider, $R = (A, B, C, D)$

$F = \{AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B\}$

Find all candidate keys.

Is R in 3NF, why? If it is not, decompose it into 3NF

Is R in BCNF, why? If it is not, decompose it into BCNF

(15 Marks)