

DBMS – ASSIGNMENT 1

M.Tech. (CS), First Year, 2022–2023

Deadline: March 15, 2023

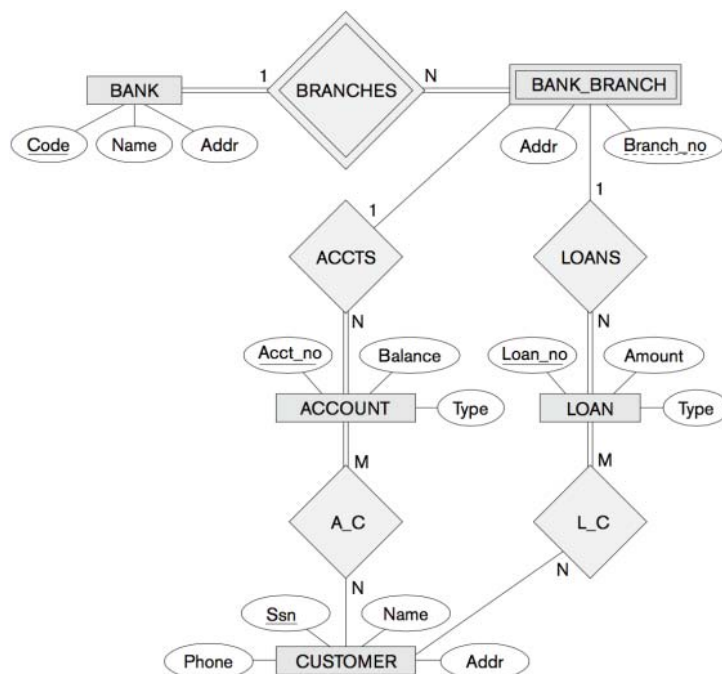
Total: 5 marks

SUBMISSION INSTRUCTIONS

1. Submit all the solutions in a single file.
2. Naming convention for your submission file (assuming CS22xx is your roll number): CS22xx-assign1 (.rtf, .docx, .doc, .pdf, .tex, etc.).
3. To submit a solution file (say CS22xx-assign1.pdf), ensure that it is not password protected and mail to <assignisik@gmail.com> with the subject line as follows: DBMS M.Tech. (CS) 2022-24 CS22xx Assignment 1.

NOTE: All the solutions must be self-sufficient and to the point.

- Q1. Convert the following Entity-Relationship (ER) diagram related to a co-operative banking system into an appropriate relational schema that includes the set of primary and derived relations. Highlight the primary keys in all the relations.



- Q2. Consider a relation R having the functional dependencies in F . For any subset of attributes $X \subseteq R$, the closure of X is defined as the set

$$X^+ = \{A \in R \mid X \rightarrow A \text{ holds with respect to } F\}.$$

For two non-empty attribute sets Y and Z in R , prove or disprove each of the following statements.

(i) $(Y^+Z)^+ = (YZ)^+$

(ii) $(YZ)^+ = Y^+Z^+$

Q3. Let $R(x, y)$ be a relation with the following statistics:

- Count of tuples in R : $T(R) = 3000$; and
- Count of distinct values of x and y in R : $V(R, x) = 500$ and $V(R, y) = 1000$.

The records are organized in pages and 20 records fit on each page. Consider the query $\rho_{x < 500}(R)$, where 100 records match the selection predicate. Calculate how many pages will have to be accessed to answer the query if the relation R is stored in a (i) Heap file, (ii) B⁺ tree index with search key x . Assume all index pages are available in memory.