SPRING END SEMESTER EXAMINATION-2024
4th Semester B.Tech

DATABASE MANAGEMENT SYSTEM
CS20006/IT20006/CC20006/CM20006/CS-2004

(For 2022 & Previous Admitted Batches)

Time: 2 Hours 30 Minutes   Full Marks: 50

Answer any FIVE questions.
Question paper consists of two SECTIONS i.e. A and B.
Section A is compulsory.
Attempt any Four question from Sections B.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable
and *all parts of a question should be answered at one place only.*

SECTION-A

1.   Answer the following questions: [1 × 10]

(a) Discuss self join with suitable example.

(b) List the problems that can arise due to bad database design.

(c) Compare and contrast aggregation and composition with suitable examples.

(d) Consider the relation R(A,B,C,D,E,F,G,H) and set of FDs F={A->BC, CD->E, E->C, D->AEH, ABH->BD, DH->BC, AEG->G}. Is BCD->H a valid FD?

(e) Distinguish between centralized and distributed databases.

(f) Outline the significance of 'D' in A C I D properties of a transaction.

(g) Define data independence. List different types of data independence.

(h) (i) Let P, Q and S be three different entities in that ER diagram comprising single-valued attributes, except for S, which has only one multi-valued attribute.

(ii) Let R1 and R2 be two relationships between P and Q, where R1 is one-to-many while R2 is many-to-many.

(iii) Let R3 and R4 be two relationships between Q and S, where R3 is many-to-one while R4 is a many-to-many.

(iv) Relationships R1, R2, R3 and R4 do not have any attributes of their own.

How many minimum number of tables required to map this scenario into relational model?

(i) List set theory based relational algebra operations with suitable examples.

(j) Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock?

I. 2-phase locking

II. Time-stamp ordering

A. I only

B. II only

C. Both I and II

D. Neither I nor II

SECTION-B

2. (a) Explain the role of query processor and storage manager components in DBMS environment. [5]

(b) Consider the following schema: [5]

Suppliers (sid, sname, rating)

Parts (pid, pname, color)

Catalog (sid, pid, cost)

Write the following queries using SQL or Relational Algebra.

I. Display the details of the supplier with rating greater than 4.

II. Display the details of the supplier who supplies part 'P01' or 'P05'.

III. Display the name and rating of the suppliers who supplies 'RED' color part.

IV. Display the supplier details for the supplier who supplies only motherboard.

V. Display the supplier details who do not supply part 'P03'.

3. (a) Consider the ER diagram as shown below for part of a BANK database. [5]
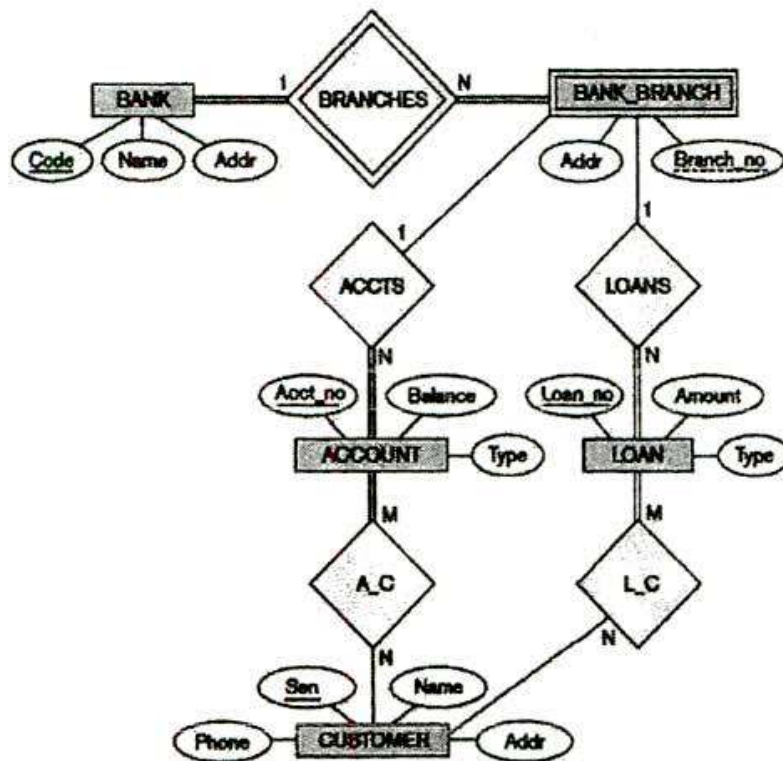
A. List the strong entity types along with their key attributes in the given ER diagram.

B. Is there any weak entity type? If so, give its name, partial key, and identifying relationship.

C. Convert the above ER diagram into relational schema.

(b) Describe lossless decomposition in the context of normalization. Consider a relation R(W, X, Y, Z) with set of FDs F={W->XY, Y->Z} is decomposed into two relations R1(W, X, Y) and R2(Y, Z). Check whether the decomposition is lossless or lossy. [5]

4. (a) Define BCNF. Consider the relation R (A, B, C, D) with set of FDs F={{A, B} → {C, D}, C → B}. Justify if the given relation R satisfies BCNF. If not, then decompose it into BCNF. [5]

(b) Describe canonical or minimal cover. Determine the minimal cover for relation R(A,B,C,D) with set of FDs F ={ A->BC, B->C, A->B, AB->C, C->D, A->D, B->BD}. [5]

5. (a) Explain the types of mapping constraints and participation constraints in ER model with suitable examples. [5]

(b) Describe the shortcoming of inner join in relational algebra. Illustrate on the need of outer join operation. Explain different types of outer join operation with a suitable example. [5]

6. (a) Given the relation R(A,B,C,D) and the set F = {AB->C, B->D, D->B} of FDs. Determine the super keys and candidate keys for the above relation. [5]

(b) Illustrate the rules of conflict serializability. Investigate if the following schedule S with transactions T1, T2, and T3 is conflict serializable or not. [5]

S: R1(A), R2(A), R3(A), W1(B), W2(A), R3(B), W2(B)

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