



### VII SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

### END SEMESTER EXAMINATIONS, DECEMBER 2023

### DATABASE MANAGEMENT SYSTEMS [ELE 4079]

REVISED CREDIT SYSTEM

Time: 3 Hours

07 December 2023

Max. Marks: 50

#### Instructions to Candidates:

- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitably assumed.

- 1A.** List out any **THREE** limitations of file-based data storage approach. Discuss how database management systems overcome these **THREE** limitations of file-based data storage.

**03**

- 1B.** Illustrate the following statement using a suitable **semantic model**.

A teacher works for a teaching department in an academic institute. One of the teachers is the head of the department. A teacher may teach one or two subjects in a semester.

**03**

- 1C.** A hash table of length 10 uses **open addressing** with hash function  $h(k) = k \bmod 10$ , and **linear probing**.

After inserting 6 values into an empty hash table, the table is as shown below.

$h(k)$	0	1	2	3	4	5	6	7	8	9
Data			42	23	34	52	46	33		

It is assumed that the data was inserted in the following sequence:

46, 34, 42, 23, 52, 33

Give proper justification and prove whether the sequence of data insertion was CORRECT or INCORRECT.

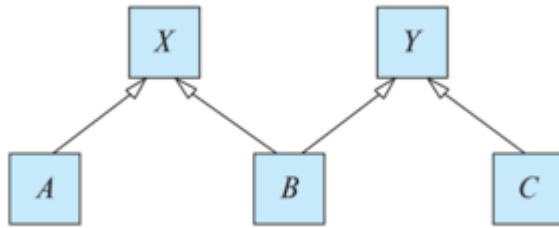
**04**

- 2A.** What is RAID in database management systems? How is reliability and performance achieved using RAID?

**03**

- 2B.** Consider the following lattice structure of generalization and specialization (attributes not shown).

**03**



For entity sets A, B, and C, explain how attributes are inherited from the higher-level entity sets X and Y.

Discuss how to handle a case where an attribute of X has the same name as some attribute of Y.

- 2C. For the following requirement with proper notations, show the Entity-Relationship (ER) model in
- binary** form
  - ternary** form

Statement: "**A student enrolls in a subject taught by a teacher**".

04

- 3A. For the following requirement show how an Entity-Relationship (ER) model in **ternary form** is transformed into a Relational model (schema). Show important steps wherever necessary.

Statement: "**A student enrolls in a subject taught by a teacher**".

03

- 3B. For the following requirement:

Statement : "**A student enrolls in a subject taught by a teacher**".

A) Show the relational schema in its **ternary form**.

B) With proper justification suggest suitable **INTEGRITY CONSTRAINTS** for the relational schema shown in (A).

03

- 3C. Consider a schema with two relations, R(A, B) and S(B, C), where all values are integers. Make no assumptions about keys. Consider the following three relational algebra expressions:

a.  $\pi_{A,C}(R \bowtie \sigma_{B=1}S)$

b.  $\pi_A(\sigma_{B=1}R) \times \pi_C(\sigma_{B=1}S)$

c.  $\pi_{A,C}(\pi_A R \times \sigma_{B=1}S)$

Two of the three expressions are equivalent (i.e., produce the same answer on all databases), while one of them can produce a different answer. Which query can produce a different answer?

Give the simplest database instance so you can think of where a different answer is produced.

04

- 4A. For the following requirement:  
**"A student enrolls in a subject taught by a teacher"**.

03

The above relational schema is assumed to be in its **binary form**. Write SQL statements.

- A) To **CREATE** database tables. Assume suitable datatypes. (INT, CHAR, VARCHAR, DATE, DECIMAL, or any other appropriate data type).
- B) To **INSERT** some sample values into the tables.

**4B.** For the following relational table SALESMAN:

salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Write SQL statement for:

- A) To delete records of salesman from "New York", "Rome" and "Paris".
- B) To increase the commission by 10% of salesmen whose commission is below the average commission of all salesmen.
- C) Update the name of "Paul Adam" from "Rome" to "Paul Adams".

**03**

**4C.** For the following relational table SALESMAN:

salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Write SQL statement for:

- A) List all the details of all salesmen.
- B) Find the details of all salesmen who are from "New York", "Rome" and "Paris".
- C) List the names and ID of salesmen who are from "London" and get commission more than the average of all salesmen from "London".
- D) Count the number of salesmen from each city.

**04**

**5A.** The following SQL statement is used to duplicate (in terms of structure and data) a relational table in MySQL:

CREATE TABLE **new\_table** AS SELECT \* FROM **original\_table**;

For the following relational table SALESMAN:

salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Write SQL statement for:

- A) Create a copy of SALESMAN table into a new table.
- B) Empty the newly created table.
- C) Insert records of salesmen who are from "London" and get commission more than the average of all salesmen from "London" into the new table.

**5B.** With the help of a **neat block diagram**, show the methodology to record temperature of a room into database.

List out the necessary hardware and software required.

Also list out some key steps taken to record temperature data into the database.

**5C.** Illustrate, with the help of a suitable example, how **conceptual**, **logical**, and **physical** model designs are created for any **chosen real-world application**.