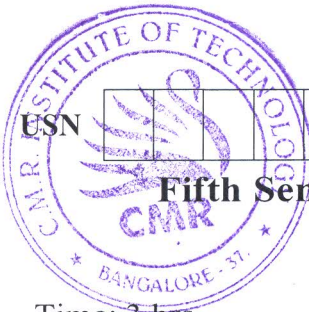USN | | | | | | | | | |

21CS53

## Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
## Database Management Systems

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

1   a.  Define DBMS. Explain all the basic operations that can be performed by DBMS on a database. **(05 Marks)**
    b.  Explain the different users of a database system. **(10 Marks)**
    c.  Describe the 3-Schema Architecture. **(05 Marks)**

**OR**

2   a.  Define the following terms:
        i) Data model   ii) Schema      iii) Insurance      iv) Canned transaction **(04 Marks)**
    b.  Describe the structural constraints of a database system with suitable example. **(10 Marks)**
    c.  Explain all the E-R diagram notations. **(06 Marks)**

### Module-2

3   a.  Explain the four relational model constraints. **(06 Marks)**
    b.  Explain all the steps of Relational database design using E-R to relational schema with a suitable example. **(06 Marks)**
    c.  Discuss the DIVISION operation of relational algebra. Find the Quotient for the following :

| SNO | DNO |
|-----|-----|
| $S_1$ | $P_1$ |
| $S_1$ | $P_2$ |
| $S_1$ | $P_3$ |
| $S_1$ | $P_4$ |
| $S_2$ | $P_1$ |
| $S_2$ | $P_2$ |
| $S_3$ | $P_2$ |
| $S_4$ | $P_2$ |
| $S_4$ | $P_4$ |

$A =$ (the table above)

$B_1 = $

| PNO |
|-----|
| $P_2$ |

$B_2 = $

| PNO |
|-----|
| $P_2$ |
| $P_4$ |

$B_3 = $

| PNO |
|-----|
| $P_1$ |
| $P_2$ |
| $P_4$ |

Find   i) $A/B_1$        ii) $A/B_2$        iii) $A/B_3$ **(08 Marks)**

**OR**

4   a.  Explain the characteristics of a relational model. **(06 Marks)**
    b.  Explain all types of outer join operations in relational algebra. Demonstrate the advantage of outer join operation over the inner join operation. **(06 Marks)**
    c.  Considering the following schema
        Sailors (sid, sname, rating, age)
        Boats (bid, bname, color)
        Reserves (sid, bid, day)
        Write a relational algebra queries for the following :
        i)  Find the names of sailors who have reserved boat#103.
        ii) Find the names of sailors who have reserved a red boat.
        iii) Find the names of sailors who have reserved a red or green boat.
        iv) Find the names of sailors who have reserved all boats. **(08 Marks)**

## Module-3

5    a.   Explain the basic data types available for attributes in SQL.    **(05 Marks)**

     b.   Demonstrate the following constraints in SQL with suitable example:
       i) NOT NULL   ii) Primary key   iii) Foreign key   iv) Default   v) Check.    **(10 Marks)**

     c.   What are triggers? Explain with syntax and suitable example.    **(05 Marks)**

### OR

6    a.   Explain the basic definition of a cursor and its usage with the help of a suitable example.    **(05 Marks)**

     b.   What are Assertions? Assuming suitable company schema write an Assertion for the condition.

       "The salary of an Employee must not be greater than the salary of the manager of the department that the employee works for".    **(05 Marks)**

     c.   Referring to the below mentioned company schema. Write the SQL queries for the following:

Employee

| Fname | Lname | Minit | Ssn | Bdate | Address | Sex | Salary | SuperSsn | Dno |
|-------|-------|-------|-----|-------|---------|-----|--------|----------|-----|

Department

| Dname | Dnumber | Mgr_Ssn | Mgr_start_date |
|-------|---------|---------|----------------|

Department_location

| Dnumber | Dlocation |
|---------|-----------|

Project

| Pname | Pnumber | Plocation | Dnum |
|-------|---------|-----------|------|

Work_on

| Essn | DNo | HRS |
|------|-----|-----|

Defendant

| Essn | Dependentname | Sex | Bdate |
|------|---------------|-----|-------|

     i)   For each department retrieve the department number, the number of employees in the department and their average salary.

     ii)   For each project on which more than 2 employees work, retrieve the project number, the project name and the number of employees who work on the project.

     iii)   For each project, retrieve the project number, the project name and the number of employees from department no. 5 who work on that project.

     iv)   For each department that has more than 5 employees, retrieve the department number and the number of its employees who are making more than \$40,000 salary.

     v)   Retrieve the names of an employees who have two or more dependents.    **(10 Marks)**

## Module-4

7    a.   Explain the types of update anomalies with examples.    **(05 Marks)**

     b.   Explain Armstrong's rules of inference.    **(05 Marks)**

     c.   What is the need for normalization? Explain 1NF, 2NF and 3NF with examples.    **(10 Marks)**

### OR

8    a.   Explain the informal design guidelines of a database.    **(06 Marks)**

     b.   What is equivalence of sets of functional dependencies? Check whether the following sets of F.D's are equivalent or not.

       $FD_1 = \{A \rightarrow B, B \rightarrow C, AB \rightarrow D\}$

       $FD_2 = \{A \rightarrow B, B \rightarrow C, A \rightarrow C, A \rightarrow D\}$    **(08 Marks)**

     c.   Write an algorithm to find the closure of functional dependency 'F'.    **(06 Marks)**

## Module-5

9    a.   Explain the desirable properties of a transaction.    **(06 Marks)**

     b.   Explain with a neat diagram, the state transition diagram of a transaction.    **(06 Marks)**

     c.   Explain two phase locking mechanism with suitable example.    **(08 Marks)**

### OR

10    a.   Discuss on the database inconsistency problem.    **(10 Marks)**

     b.   Explain Binary locks and shared locks with algorithms.    **(10 Marks)**