# FUNDAMENTALS OF RDBMS
## (CSEN 3221)

**Time Allotted : 3 hrs**                                    **Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and*
*<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

## Group – A
## (Multiple Choice Type Questions)

1.  Choose the correct alternative for the following:                    **10 × 1 = 10**

    (i)   In airline reservation system, the entities are date, flight number, place of departure, destination, type of plane and seats available. The primary key is
          (a) flight number                           (b) flight number + place of departure
          (c) flight number + date                    (d) flight number + destination.

    (ii)  If every non-key attribute is functionally dependent on the primary key, then the relation will be in
          (a) first normal form                       (b) second normal form
          (c) third normal form                       (d) fourth normal form.

    (iii) Consider R1 and R2 are two different relations, which operation will produce a relation that has all attributes of R1 and R2 and guaranteed to have tuples
          (a) Union                                   (b) Intersection
          (c) Cartesian Product                       (d) Join.

    (iv)  Cartesian product in relational algebra is
          (a) Unary operator                          (b) Binary operator
          (c) Ternary operator                        (d) Not defined.

    (v)   Redundancy is dangerous as it is a potential threat to data
          (a) Integrity                               (b) Consistency
          (c) Sufficiency                             (d) None of the above.

    (vi)  Which dependency do we remove while moving from 2NF to 3NF in database normalization?
          (a) Functional Dependency                   (b) Full Functional Dependency
          (c) Partial Dependency                      (d) Transitive Dependency.

    (vii) Which of the following operations is used if we are interested in only certain columns of table?
          (a) PROJECTION      (b) UNION        (c) SELECTION        (d) JOIN.

(viii)     _____ is NOT a type of SQL constraint.
     (a) Primary Key                (b) Foreign Key
     (c) Alternate Key            (d) Unique

(ix)     What is a relation in RDBMS?
     (a) Key                       (b) Table
     (c) Row                     (d) Data Types.

(x)     What is an Instance of a Database?
     (a) The state of the database system at any given point of time
     (b) The entire set of attributes of the Database put together in a single relation
     (c) The initial values inserted into the Database immediately after its creation
     (d) The logical design of the database system.

# Group - B

2.  (a)  Distinguish between the concept of Super key and Candidate key with suitable example.                                    *[(CO4) (Remember/LOCQ)]*
    (b)  What is data independence? Explain the concept of physical and logical data independence.                                *[(CO2) (Understand/LOCQ)]*
    (c)  What is data dictionary? List three important functions of DBA [Database Administrator].                                  *[(CO1) (Analyze/IOCQ)]*

**3 + 4 + (2 + 3) = 12**

3.  (a)  What is cardinality ratio?                                    *[(CO2) (Remember/LOCQ)]*
    (b)  Distinguish between strong and weak entity set with suitable example.
                                                                       *[(CO3) (Understand/LOCQ)]*
    (c)  The tourism department wishes to computerize its data.  The information consists of monuments of tourist interest, their location and history.  Monuments are classified according to historical, religious and architectural importance.  The list of facilities available at each spot are (i) living accommodation in terms of hotels, their names, category and the number of rooms available and (ii) local transport facilities in terms of service provider name, tours with their tariff and timing.  Draw an ER diagram by identifying entities, relationships, attributes, primary keys.         *[(CO4)(Analyse/IOCQ)]*

**2 + 4 + 6 = 12**

# Group - C

4.  Consider the following relations:
    HOTEL ( <u>hotelno</u>, name, city)
    ROOM ( <u>roomno, hotelno</u>, type, tariff)
    BOOKING ( <u>hotelno, guestno</u>, datefrom, dateto, roomno)
    GUEST ( <u>guestno</u>, name, city)
    Write down the expressions in relational algebra for the following queries:
    (i)   List all the hotels which are situated in KOLKATA.
    (ii)  List all single rooms with a charge below 1000.

(iii) List all guests currently staying at TAJ hotel.

(iv) List the price per night and type of all rooms at GRAND hotel. *[(CO2) (Analyze /IOCQ)]*

**(4 × 3) = 12**

5. (a) Explain the terms 'partial functional dependency' and 'transitive dependency'.

*[(CO4) (Understand/LOCQ)]*

(b) Given a relational schema **Supply(sno, city, status, pno, qty)** with FD set
**F = { sno →city, city → status, {sno, pno} → qty}**
Reduce it into 3NF. *[(CO4) (Analyze /HOCQ)]*

(c) What is lossless decomposition? *[(CO4) (Understand /IOCQ)]*

**4 + 6 + 2 = 12**

# Group - D

6. Consider the following tables:
DEPT ( <u>DCODE</u>, DNAME )
EMP ( <u>ECODE</u>, ENAME, BASIC, DCODE, DT_JN)
Write down the SQL statements for the following:

(i) For each department, show DNAME and total basic of the employees in the department.

(ii) Find out the name of the departments where no person is working.

(iii) Find out the name of the employees who are working in the department named as "PQR".

(iv) Find out the maximum basic among the employees who has joined after the year 2000. *[(CO3) (Analyze /HOCQ)]*

**(4 + 4 + 2 + 2) = 12**

7. Consider a relational database as given below:
Flight (<u>flight_no</u>, flight_name, start_airport)
Seat (<u>seat_no, flight_no</u>, type, price)
Schedule (<u>flight_no</u>, day_of_week, type)
Where the underlined attributes are the primary keys. Write SQL queries for the following:

(i) Find all the flight names starting from station "ABC"

(ii) List the price and type of all seats of "PQR" flight

(iii) List the flight number and price of all "business" (type) seats with price below Rs 6000

(iv) Find all those flight names which are scheduled to run on Saturdays and Sundays. *[(CO3) (Analyze /HOCQ)]*

**(4 × 3) = 12**

# Group - E

8. (a) What is the role of the Two-Phases in a Two-Phase Locking Protocol?

*[(CO4)(Remember/LOCQ)]*

(b) State and explain the ACID properties of transactions? *[(CO3)(Understand/LOCQ)]*

    (c)    Define concurrent access of database. What are the reasons for which concurrency control is required? List the rule of serializability.

*[(CO4) (Analyse/IOCQ)]*
**2 + 4 + 6 = 12**

9.  (a)    Distinguish between fixed and variable size records in database file organization with example.    *[(CO1) (Remember/LOCQ)]*

    (b)    What is view serializability?    *[(CO2) (Understand/LOCQ)]*

    (c)    Write short notes on any two of the following:
        (i)   Lost Update problem
        (ii)  Recovery Management
        (iii) BTree.    *[(CO2) (Analyse/IOCQ)]*

**4 + 2 + 6 = 12**

| Cognition Level | LOCQ | IOCQ | HOCQ |
|---|---|---|---|
| Percentage distribution | 30.21 | 38.54 | 31.25 |

**Course Outcome (CO):**

After the completion of the course students will be able to
- Identify the basic concepts and various data model used in database design.
- Formulate relational algebra expression for queries and evaluate it using the concept of query processing and Optimization.
- Create RDBMS schema and formulate queries based on that schema using SQL.
- Apply Normalization and various types of dependencies for evaluating a relational database design.
- Apply and relate to concept of transaction, concurrency control and recovery in database.
- Understand basic database storage structures and access techniques: file and page organizations, indexing methods including BTree and hashing.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*