

**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 any 5 (five) from Group B to E, taking at least one from each group.

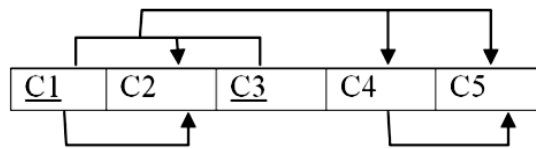
Candidates are required to give answer in their own words as far as practicable.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The overall design of a database is called
(a) schema of the database (b) structure of the database
(c) the screen of the database (d) view of the database.
- (ii) According to the levels of abstraction, the schema at the intermediate level is called
(a) conceptual schema (b) physical schema
(c) subschema (d) view.
- (iii) It is an abstraction through which relationships are treated as higher level entities
(a) Generalization (b) Specialization
(c) Aggregation (d) Inheritance.
- (iv) During transaction before commit which of the following statement is done automatically in case of shutdown?
(a) Rollback (b) Commit
(c) View (d) Flashback.
- (v) Relation R=(A,B,C,D) with AB as primary key. Choose one FD such that R should be in 1NF but not in 2NF.
(a) AB -> C (b) AB -> D (c) A -> D (d) AB-> CD.
- (vi) The part of a database management system which ensures that the data remains in a consistent state is
(a) authorization and integrity manager (b) buffer manager
(c) transaction manager (d) file manager.
- (vii) What is the name of the query that is placed within a WHERE or HAVING clause of another query
(a) Multi Query (b) Sub Query
(c) Super Query (d) Aggregate Query.

- (b) Describe the *cartesian product* and *natural join* operations of Relational Algebra with suitable examples. [(CO2) (Analyze/LOCQ)]
- (c) Keeping in mind your design from question 3.c, write Relational Algebra Operations for the following:
- (i) Find name of all customers who have bought the book *Sonar Kella* and *Passage To India* published by *Ananda*.
- (ii) Find the total royalties received by the author for the books *Sonar Kella* and *Passage To India*.
Find the name of the highest priced book published in 2021. [(CO3) (Analyze/IOCQ)]
- 2 + 4 + 6 = 12**

5. (a) Given the dependency diagram shown in the following figure, (the primary key attributes are underlined)



- (i) Identify and discuss each of the indicated dependencies. [(CO4)(Analyze/IOCQ)]
- (ii) Create a database whose tables are at least in 3NF, showing dependency diagram for each table. [(CO4)(Create/HOCQ)]
- (b) What problems occur if there is transitive dependency? Explain with proper examples. [(CO4)(Understand/LOCQ)]
- (4 + 5) + 3 = 12**

Group - D

6. Consider the following relations:
- (i) **Employee** (Emp_Code, Emp_Name, Desig, Manager, Date_of_Joining, Salary, Dept_Code)
With Constraints: *Primary Key* is Emp_Code, *Foreign Key*: Manager references Employee(Emp_Code), Dept_Code references Department(Dept_Code)
- (ii) **Department** (Dept_Code, Dept_Name, Location) With Constraints: *Primary Key* is Dept_Code
- Write the following queries in SQL:
- (i) List the average salary and number of employees working in each department.
- (ii) List the names of those departments where the total salary is greater than 15000.
- (iii) List the names of the employees and the names of their managers under whom they are working.
- (iv) List the details of those employees who are getting salary greater than the average salary of their department. [(CO3)(Create/HOCQ)]
- (2 + 2 + 4 + 4) = 12**

7. (a) Distinguish between primary key and unique key constraints. [(CO1) (Remember/LOCQ)]

- (b) How can we implement foreign key constraints in SQL? Explain with examples. [(CO3) (Understand/LOCQ)]
- (c) Construct the table EMPLOYEE with the following attributes:
EMPLOYEE(ENAME, E_ID, DATE_OF_BIRTH, SALARY, CITY, PINCODE)
Write the following SQL queries:
(i) Display the Name and Id of all employees whose salary is greater than 80,000 And lesser than 90,000.
(ii) Display the Name and Id of all employees who reside in any of the following Cities MUMBAI, KOLKATA, PUNE, HYDERABAD and whose salary is greater than 100000. [(CO1) (Analyze/IOCQ)]
- 2 + 4 + 6 = 12**

Group - E

8. (a) Distinguish between Locking and Time_Stamping? [(CO4) (Remember/LOCQ)]
(b) Draw and explain the State-Transition diagram of a transaction, also explain the Properties of *Atomicity* and *Durability* with regard to transactions. [(CO3) (Understand/LOCQ)]
(c) Consider the following two transactions T1 and T2.
T1: read_lock(Y); T2: read_lock(X);
 read_item(Y); read_item(X);
 unlock(Y); unlock(X);
 write_lock(X); write_lock(Y);
 read_item(X); read_item(Y);
 X=X+Y; Y=X+Y;
 write_item(X); write_Item(Y);
 unlock(X); unlock(Y);
Considering initial values X=20 and Y=30 what will be the result of serial schedule T1 followed by T2. [(CO4)(Analyse/IOCQ)]
- 3 + 4 + 5 = 12**
9. (a) Justify the following statement: Concurrent execution of transactions is more important when data must be fetched from (slow) disk or when transactions are long, and is less important when data are in memory and transactions are very short. [(CO5)(Understand/LOCQ)]
(b) Consider the following two transactions:-
T1 : read (A);
 read (B);
 B = A + B;
 write (B);

T2 : write (A);
 read (B);
Add lock and unlock instructions so that the transaction T1 and T2 observe two-phase locking protocol. Is it deadlock free? [(CO5)(Apply/IOCQ)]
- 4 + 8 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54	43.75	17.70

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

