

**DATABASE MANAGEMENT SYSTEMS
(CSBS 3102)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which Schema is also known as Physical Schema?
(a) Internal (b) Conceptual (c) External (d) View.
- (ii) Which of the following is not a feature of DBMS?
(a) Minimum Duplication and Redundancy of Data
(b) High Level of Security
(c) Single-user Access only
(d) Support ACID Property.
- (iii) If a relation has a 4NF and no join dependency, and when it joins, it should be ____, it is considered 5NF.
(a) Lossful (b) Lesser (c) Lossless (d) Full
- (iv) Armstrong axioms are called sound because
(a) they are expensive
(b) they cannot generate correct functional dependencies
(c) they allow us to generate the complete closure
(d) they cannot generate incorrect functional dependencies.
- (v) In addition to removing undesirable characteristics, normalization also eliminates __ anomalies.
(a) insert (b) update (c) delete (d) all of the above
- (vi) Which join refers to join records from the write table that have no matching key in the left table are include in the result set
(a) Left outer join (b) Right outer join
(c) Full outer join (d) Half outer join
- (vii) A _____ is a special kind of a store procedure that executes in response to certain action on the table like insertion, deletion or updation of data.
(a) procedures (b) triggers (c) functions (d) locking

- (viii) A table is in BCNF if it is in 3NF and if every determinant is a _____ key.
 (a) Dependent (b) Normal (c) Candidate (d) Both Normal and Candidate
- (ix) Database _____, which is the logical design of the database, and the database _____, which is a snapshot of the data in the database at a given instant in time.
 (a) Instance, Schema (b) Relation, Schema
 (c) Relation, Domain (d) Schema, Instance
- (x) When the values in one or more attributes being used as a foreign key must exist in another set of one or more attributes in another table, we have created a(n):
 (a) Transitive Dependency (b) Insertion Anomaly
 (c) Referential Integrity Constraint (d) Normal Form.

Fill in the blanks with the correct word

- (xi) The one name of a transaction state is _____.
- (xii) It can both read and write on the item, if a transaction has obtained a _____ lock.
- (xiii) The minimal set of super key is called _____.
- (xiv) A type of query that is placed within a WHERE or HAVING clause of another query is called _____.
- (xv) A data dictionary doesn't provide information about _____.

Group - B

2. Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Each insurance policy covers one or more cars, and has one or more premium payments associated with it. Each payment is for a particular period of time, and has an associated due date, and the date when the payment was received.
- (i) Based on the description above, construct a clean and concise ER diagram for the car insurance company. [[CO2](Understand/LOCQ)]
- (ii) Convert the ER design into a set of tables. [[CO6](Create/IOCQ)]
- (iii) Merge and reduce the set of tables without introducing redundancy, if possible. [[CO3](Analyse & Apply/HOCQ)]
- (6 + 4 + 2) = 12**
3. (a) author(authorid,firstname,lastname)
 authorpub(authorid,pubid,authorposition)
 book(bookid,booktitle,month,year,editor)
 pub(pubid,title,bookid)
 Underline notation defines as primary key.
 Give queries expressed in relational algebra for the following:
- (i) Which authors authored a pub that was published in July?
 (ii) Find the names of all authors who have at least one publication in the database.
 (iii) Find the names of all authors who are not book editors.
 (iv) Find the details (author name, pub title) of the book(s) whose booktitle is "DBMS".
 (v) Find the number of publications of author named "Korth". [[CO1](Apply/IOCQ)]

- (b) Define Right outer join with a suitable example. [[CO2](Understand/LOCQ)]
(5 × 2) + 2 = 12

Group - C

4. (a) $R = (A, B, C, D, E)$. We decompose it into $R_1 = (A, B, C)$, $R_2 = (C, D, E)$. The set of functional dependencies is: $A \rightarrow BC$, $CD \rightarrow E$, $B \rightarrow D$, $E \rightarrow A$. Check whether the dependency is a lossless decomposition or lossy decomposition. [[CO3](Apply/IOCQ)]
- (b) Suppose, a relational schema $R(A, B, C, D, E, F, G, H)$ and set of functional dependencies: $F \{ A \rightarrow BC, E \rightarrow C, AH \rightarrow D, CD \rightarrow E, D \rightarrow AEH, DH \rightarrow BC \}$ Compute AE^+ . Is $BCD \rightarrow H$ valid or not? [[CO3](Apply/IOCQ)]
- (c) Consider a relation $R(A, B, C, D, E)$ with the following dependencies: $\{AB \rightarrow C, CD \rightarrow E, DE \rightarrow B\}$ Is AB a candidate key of this relation? If not, is ABD ? Explain your answer. [[CO3](Apply/IOCQ)]
4 + 4 + 4 = 12
5. (a) Consider the following set F of functional dependencies: $F = \{ A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C \}$. Clearly mention all the steps to find the canonical cover of the functional dependency given above. [[CO3](Apply/IOCQ)]
- (b) $R = (A, B, C, D, E, F)$, $F_1 = \{A \rightarrow BC, B \rightarrow CDE, AE \rightarrow F\}$, $F_2 = \{A \rightarrow BCF, B \rightarrow DE, E \rightarrow AB\}$ Check whether F_1 and F_2 are equivalent or not. [[CO3](Apply/IOCQ)]
- (c) Given a relation $R(A, B, C, D, E)$ and Functional Dependency set $FD = \{ A \rightarrow B, B \rightarrow E, C \rightarrow D \}$, determine whether the given R is in 2NF? If not convert it into 2NF. [[CO3](Apply/IOCQ)]
4 + 4 + 4 = 12

Group - D

6. (a) Consider the following relational database tables, and write the SQL queries for (i)-(v):

TABLE: EMPLOYEE

ECODE	NAME	DESIG	SGRADE	DOJ	DOB
101	Vikrant	Executive	S03	2003-03-23	1980-01-13
102	Ravi	Head-IT	S02	2010-02-12	1987-07-22
103	John Cena	Receptionist	S03	2009-06-24	1983-02-24
105	Azhar Ansari	GM	S02	2009-08-11	1984-03-03
108	Priyam Sen	CEO	S01	2004-12-29	1982-01-19

TABLE: SALGRADE

SGRADE	SALARY	HRA
S01	56000	18000
S02	32000	12000
S03	24000	8000

- (i) To display NAME AND DESIG of those employees whose sgrade is either 'S02' or 'S03'.
- (ii) To display NAME, DESIG, SGRADE of those employees who joined in the year 2023.
- (iii) To display number of employee working in each SALGRADE from table EMPLOYEE.
- (iv) To display NAME, DESIG, SALARY, HRA of employees whose salary is less than 50000.
- (v) To count different types of sgrade from EMPLOYEE table. [[CO4](Apply/IOCQ)]

- (b) What is difference between Cartesian Join and Cross Join? [[CO4](Remember/LOCQ)]
(5 × 2) + 2 = 12
7. (a) Consider the following relational database tables, and write the SQL queries for (i)-(v):
 salesman (salesman_id,name,city,commission)
 customer(customer_id,customer_name,city,grade,salesman_id)
 orders(order_no,purch_amt,order_date,customer_id,salesman_id)
- (i) Display all the orders that had amounts that were greater than at least one of the orders from September 5th 2023.
 (ii) Display all those orders by the customers not located in the same cities where their salesmen live.
 (iii) Find the name and ids of all salesmen who had more than one customer.
 (iv) Find all orders attributed to salesmen in Kolkata.
 (v) Display all the orders issued by the salesman 'Ram Kumar Das' from the orders table. [[CO4](Apply/IOCQ)]
- (b) What is the data type of DUAL table? When this table is required? [[CO4](Remember/LOCQ)]
(5 × 2) + 2 = 12

Group - E

8. (a) Explain different types of implicit cursor attributes with proper example. [[CO5](Remember/LOCQ)]
 (b) How to know information about triggers. What is active set? [[CO5](Remember/LOCQ)]
 (c) Explain the term “Cascading Rollbacks” with the proper example. [[CO5](Remember/LOCQ)]
4 + 4 + 4 = 12
9. (a) What is lock table ? What are the components of lock table? [[CO5](Remember/LOCQ)]
 (b) Compare and contrast between Strict 2PL and Rigorous 2PL. [[CO5](Analyse/IOCQ)]
 (c) To deal with the wasted space, how many kinds of blocks are used in file? How these blocks are used explain with proper diagram. [[CO5](Analyse/HOCQ)]
4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	29.17	64.58	6.25

Course Outcome (CO):

After the completion of the course students will be able to

- CSBS3102.1. Demonstrate the concepts of various data model and schemas used in database design.
 CSBS3102.2. Design relational database schemas using the conceptual modeling tools like ER diagrams.
 CSBS3102.3. Analyze the functional dependencies and normalize the relational database design.
 CSBS3102.4. Apply the query language to manipulate the relational databases.
 CSBS3102.5. Describe the concept of transaction, basic database storage structures, and indexing.
 CSBS3102.6. Construct database schema for various real life problems.

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