

DATABASE MANAGEMENT SYSTEMS
(CSEN 3102)

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) A transaction that completes its execution is said to be
(a) Aborted (b) Committed
(c) Rolled back (d) Partially committed.
- (ii) In case of entity integrity, the primary key may be
(a) Not null (b) Null
(c) Duplicate (d) Both null and not null.
- (iii) A key that represents relationship between different tables is called a
(a) Primary Key (b) Candidate Key
(c) Foreign Key (d) Secondary Key.
- (iv) Which of the following is not an ACID property?
(a) Durability (b) Consistency
(c) Isolation (d) Integrity.
- (v) DML language is used to
(a) define schema (b) access data
(c) ensure security (d) all of these.
- (vi) By default, the 'order by' clause in SQL lists items in ____ order.
(a) Descending (b) Any
(c) Same (d) Ascending.
- (vii) Which of the following is used to denote the projection operation in relational algebra?
(a) π (Pi) (b) σ (Sigma) (c) λ (Lamda) (d) Ω (Omega).
- (viii) A schedule is _____ if it is conflict equivalent to a serial schedule.
(a) Conflict serializable (b) View serializable
(c) Non serializable (d) None of the above.

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- (ix) Second normal form (2NF) is based on the concept of _____
(a) Closure Dependency (b) Transitive Dependency
(c) Full Dependency (d) Partial Dependency.
- (x) If every functional dependency in set E is also in closure of set F, then
(a) E is covered by F (b) F is covered by E
(c) E is covered by F⁺ (d) Both (a) and (b).

Group - B

2. (a) What are the advantages of DBMS over File-processing systems? Explain in brief. [(CO1)(Understand/LOCQ)]
(b) What is a DBA? What are the different functions of a DBA? [(CO2)(Remember/LOCQ)]

6 + (2 + 4) = 12

3. (a) Define the following with suitable examples:
(i) Multi-valued attribute
(ii) Aggregation
(iii) One-to-Many relationship. [(CO3)(Remember/LOCQ)]
(b) What do you understand by Weak Entity? How is the primary key of a weak entity formed? [(CO3)(Understand/LOCQ)]

(3 × 2) + (4 + 2) = 12

Group - C

4. (a) Explain the difference between Cartesian product and Natural join. [(CO4)(Understand/LOCQ)]
(b) What is Normalisation? Describe the different anomalies that may arise if relations are not normalised. [(CO8)(Remember/LOCQ)]

4 + (2 + 6) = 12

5. (a) Let R be a relation: R = (A, B, C, D, E, F) having the following functional dependencies.
F = { A → B, A → C, CD → E, CD → F, B → E }
Find out candidate key(s) of R. What is the highest normal form that relation R is in? [(CO8)(Evaluate/HOCQ)]

- (b) What do you understand by partial and multi-valued dependency? [(CO8)(Understand/LOCQ)]

- (c) Justify the statement "BCNF is stronger than 3NF". [(CO8)(Analyze/IOCQ)]

(2 + 3) + (2 + 2) + 3 = 12

Group - D

6. (a) Consider a relational database as given below:
Train (train-no, train_name, start_station)
Coach(coach-no, train-no, type, price)
Schedule(train_no, day_of_week, type)

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Where the underlined attributes are the primary keys.

Write the following queries in SQL:

- (i) Find all the train names starting from station 'Howrah'.
- (ii) List the price and type of all coaches of "Satabdi Express" train in descending order of price.
- (iii) List the train number and price of all "2 A/C" (type) coaches with price below Rs.3550/-
- (iv) Find all those train names which are scheduled to run except Mondays and Thursdays (i.e. day_of_week) [(CO7) (Design/HOCQ)]

- (b) What is the difference between delete and drop commands in SQL?
[(CO7)(Remember/LOCQ)]

$(4 \times 2) + 4 = 12$

7. (a) Define referential integrity constraint. What restrictions does it put on the relations? Explain with an example. [(CO4)(Understand/IOCQ)]

- (b) What is a trigger? How does it work? [(CO9)(Understand/LOCQ)]

$(4 + 2) + (4 + 2) = 12$

Group - E

8. (a) Describe the ACID properties of a transaction. [(CO2) (Remember/LOCQ)]

- (b) Let T1 and T2 be transactions that operate on same data items A and B. Let r1(A) mean that T1 reads A, w1(A) mean that T1 writes A, same for T2. Consider the following schedule S. Using a precedence graph, determine whether S is conflict serializable or not?

S: r1(A); w1(A); r2(A); w2(A); r1(B); w1(B); r2(B); w2(B)

[(CO2)(Evaluate/HOCQ)]

- (c) What is two-phase locking protocol? How does it guarantee serializability?

[(CO2)(Analyse/IOCQ)]

$4 + 4 + 4 = 12$

9. (a) Define primary and clustering index with suitable examples.

[(CO2)(Understand/LOCQ)]

- (b) What is B+ tree? What is its advantage(s) over B-tree indexing?

[(CO2)(Understand/LOCQ)]

$(3 \times 2) + 6 = 12$

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	68.75%	13.6%	17.71%

Course Outcome (CO):

After the completion of the course students will be able to

1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
2. Define the terminology, features, classifications, and characteristics embodied in database systems.

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3. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
4. Demonstrate an understanding of the relational data model.
5. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
6. Formulate, using relational algebra, solutions to a broad range of query problems.
7. Formulate, using SQL, solutions to a broad range of query and data update problems.
8. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
9. Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
10. Use a desktop database package to create, populate, maintain, and query a database.
11. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

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

Department & Section	Submission Link
CSE BACKLOG	Google classroom Link: https://classroom.google.com/c/NDYyMjc3NjQzMDM4
	Submission Link: https://classroom.google.com/c/NDYyMjc3NjQzMDM4/a/NDYyMjc4MTE4MjE2/details