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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2025 - 2026)

Subject: Database Management Systems

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- (1.1) A rectangle is symbolized in an E-R diagram as (CO1, K1) 1
- (a) Entity set
- (b) Relationship set
- (c) Attributes of a relationship set
- (d) Primary key
- (1.2) Data independence refers to (CO1, K1) 1
- (a) data duplication
- (b) data security
- (c) immunity to schema changes
- (d) data storage
- (1.3) In..... normal form we don't have transitive dependencies. (CO2, K2) 1
- (a) 1NF
- (b) 2NF
- (c) 3NF
- (d) BCNF
- (1.4) A relation is in 1NF if it does not contain any _____. (CO2, K1) 1
- (a) Determinants
- (b) Repeating groups
- (c) Null values in primary key fields
- (d) Functional dependencies
- (1.5) The number of operands used by binary operators in SQL are: (CO3, K1) 1

- (a) 1
(b) 2
(c) 3
(d) 4
- (1.6) Determine which option is not an integrity constraint in SQL. (CO3, K1) 1
(a) Not null
(b) Positive
(c) Unique
(d) Check 'predicate'
- (1.7) Assess the main goal of recovery mechanisms in DBMS. (CO4, K2) 1
(a) To ensure high availability of data
(b) To prevent unauthorized access to data
(c) To maintain consistency and integrity of data
(d) To optimize query performance
- (1.8) Identify the most critical ACID feature for transaction reliability. (CO4, K1) 1
(a) Atomicity
(b) Adaptability
(c) Abstraction
(d) Accessibility
- (1.9) is the first step of access control. (CO5, K1) 1
(a) Accountability logging
(b) ACL verification
(c) Subject authorization
(d) Subject identification
- (1.10) MAC stands for (CO5, K1) 1
(a) Managed Access Control
(b) Mandatory Access Control
(c) Manual Access Control
(d) Master Access Control

2. Attempt all parts:-

- (2.1) Briefly discuss the two levels of data independence. (CO1, K2) 2
- (2.2) Compute the closure of A under F for the given relation schema $R = \{A, B, C, G, H, I\}$ and functional dependency set $F = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow H, C \rightarrow G\}$. (CO2, K3) 2
- (2.3) Differentiate between implicit and explicit cursors in SQL. (CO3, K3) 2
- (2.4) Discuss cascading schedule with an example. (CO4, K2) 2
- (2.5) Differentiate object-relational databases from object-oriented databases. (CO5, K3) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) Discuss the different participation constraints of E-R model with suitable examples. 6

(CO1, K2)

- (3.2) Compare and contrast between file system and DBMS. (CO1, K3) 6

Answer any one of the following:-

- (3.3) Given a relation R (A,B,C,D,E,F) and functional dependency set $\{AB \rightarrow C, C \rightarrow D, D \rightarrow EF, F \rightarrow A, D \rightarrow B\}$. Relation R is decomposed into R1(A,B,C) , R2(C,D,E), R3(E,F). Check whether decomposition is lossless or lossy. (CO2, K4) 6
- (3.4) Given a relation schema R = {A,B,C,D,E} and a set of functional dependency F= {A $\rightarrow$ BC, CD $\rightarrow$ E, B $\rightarrow$ D, E $\rightarrow$ A }, Find the minimal cover for above given FD's. (CO2, K4) 6

Answer any one of the following:-

- (3.5) Construct a PL/SQL procedure to determine whether a number is prime or not. (CO3, K4) 6
- (3.6) Highlight the importance of creating views and indexes in SQL. Give SQL syntaxes for the illustration. (CO3, K2) 6

Answer any one of the following:-

- (3.7) Determine conflict serializability of schedules S1, S2, and S3. For each serializable schedule find the equivalent schedule. (CO4, K4) 6
S1: r1(x); r3(x); w3(x); w1(x); r2(x)
S2: r3(x); r2(x); w3(x); r1(x); w1(x)
S3: r1(x); r2(x); r3(y); w1(x); r2(z); r2(y); w2(y)
- (3.8) Illustrate the phases of validation-based protocol in concurrency control. (CO4, K2) 6

Answer any one of the following:-

- (3.9) Discuss the ETL process in building a data warehouse. Also give the significance of data warehouse in decision support systems. (CO5, K2) 6
- (3.10) Elaborate any three storage architecture patterns of NoSQL with relevant diagrams. (CO5, K2) 6

SECTION-C 50

4. Answer any one of the following:-

- (4.1) Construct an Entity-Relationship (ER) diagram for a university registration system. The system should manage information about students, courses, instructors, and registrations. Each student can enroll in multiple courses, and each course can have multiple students enrolled. An instructor can teach multiple courses, and each course is taught by a single instructor. Additionally, each student's registration in a course should capture the semester and year of registration. Include appropriate entity types, relationships, and attributes in your diagram. (CO1, K3) 10
- (4.2) Draw an ER diagram of On-Line Book shop. Also reduce ER diagram of On-Line Book shop to relational tabular form. (CO1, K3) 10

5. Answer any one of the following:-

- (5.1) Discuss the following in detail with suitable examples (CO2, K2) 10
a. Partial dependency
b. Join dependency
c. Trivial and Non -Trivial dependency

- (5.2) Find out the candidate keys of R (A, B, C, D) under $F = \{A \rightarrow B, B \rightarrow C, AC \rightarrow D\}$. (CO2, K3) 10
6. Answer any one of the following:-
- (6.1) Discuss characteristics, advantages and disadvantages of SQL. Write SQL commands for the following operations (CO3, K4) 10
- a. Create a table employee with attributes (emp_id, emp_name, salary, phone no).
 - b. Insert at least five rows in employee table.
 - c. Find the sum and average of salary.
 - d. Find minimum and maximum salary of employee.
- (6.2) Consider the following relational database schema student(Student_ID, Stu_Name, Stu_Subject_ID, Stu_Marks, Stu_Age), Subject(Subject_ID, Subject_Name). Write SQL queries for the following (CO3, K4) 10
- (i) Create the table
 - (ii) Insert the data into the table.
 - (iii) View the specific record of the table
 - (iv) Update the records of the table
7. Answer any one of the following:-
- (7.1) Assess the effectiveness of timestamp-based protocols in maintaining serializability. (CO4, K3) 10
- (7.2) Analyze the given schedule S is conflict serializable or not. S: R4(A), R2(A), R3(A), W1(B), W2(A), R3(B), W2(B). Justify the outcome with a clear precedence graph and reasoning. (CO4, K4) 10
8. Answer any one of the following:-
- (8.1) Categorize various types of Intrusion Detection Systems and analyze their working mechanisms. (CO5, K2) 10
- (8.2) Describe the importance of NoSQL databases over relational databases. Give suitable examples of MongoDB CRUD operations. (CO5, K3) 10