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Question Paper Code : 90927

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Fourth Semester

Computer Science and Engineering

CS 3492 — DATABASE MANAGEMENT SYSTEMS

**(Common to : Computer and Communication Engineering/Computer Science and
Business Systems/Information Technology)**

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Relational DBMS. Give Examples.
2. Differentiate Primary Key and Super Key.
3. What is Non-loss Decomposition?
4. Draw an ER model showing many-to-many relationship.
5. Define Concurrency.
6. Compare binary locks, to exclusive or shared locks. Why is the latter type of locks preferable?
7. State the need for query optimization using heuristics.
8. What is the significance of indexing in DBMS?
9. List the various uses of graph databases.
10. What is SQL Injection attack?

PART B — (5 × 13 = 65 marks)

11. (a) Outline the three schema architecture with neat diagram. Illustrate the schema diagram for a University database. (6+7)

Or

- (b) Consider the following schemas. The primary key for each relation is denoted by the underlined attribute.

LIVES (person-name, street, city)

WORKS (person-name, company-name, salary)

LOCATED-IN (company-name, city)

MANAGES (person-name, manager-name)

Write relational algebra expressions for the following queries:

- (i) Find the name of all employees (i.e., persons) who is working under manager 'X'. (2)
- (ii) Find the name and city of all employees who work for City Bank. (2)
- (iii) Find the name, street and city of all employees who work for City Bank and earn more than \$10,000. (3)
- (iv) Find all employees who live in the same city as the company they work for. (3)
- (v) Find all persons who do not work for City Bank. (3)

12. (a) Use an Entity-Relationship Diagram to depict the following requirements for a restaurant:

The restaurant employs a number of chefs. A record is kept of each chef's name, address, phone number and salary. Each chef can prepare a number of meals. The name of the meal and the price of the meal are recorded. Each meal consists of a number of ingredients. The name of the ingredient and the quantity required for that particular meal is recorded. These meals are ordered by customers. A record is kept of the customer's name, address and phone number. A record is kept of the time and date the meal is ordered. Include any attributes you think should be represented. State any assumptions you have made in the design of the E-R diagram.

Or

- (b) Consider the following relation:

TRIP (Trip_id, Start_date, Cities_visited, Cards_used)

This relation refers to business trips made by company salespeople. Suppose the TRIP has a single Start_date but involves many Cities and salespeople may use multiple credit cards on the trip. Make up a mock-up population of the table.

- (i) Discuss what Functional Dependencies and/or Multivalued Dependencies exist in this relation. (6)

- (ii) Show how you will go about normalizing the relation. (7)

13. (a) Outline the Two Phase Locking Protocol. Discuss how it guarantees serializability. Explain with an example.

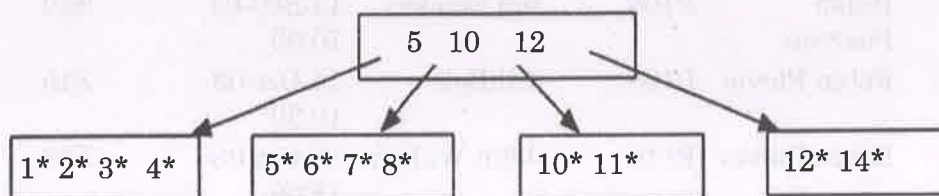
Or

- (b) Outline the ARIES Algorithm and discuss the techniques it uses to reduce the time taken for recovery and how it reduces the overhead of check-pointing.

14. (a) Explain the steps involved in Query Processing with an example.

Or

- (b) Describe the structure of B+ tree and list the characteristics of a B+tree with indexing operation. Consider the B+-tree with order 2 (max 4 pointers per node) drawn below. Draw what the tree would look like after inserting 9*.



15. (a) Give an overview of Transaction management in Distributed Databases.

Or

- (b) Why is database security important for an organization? Explain the available security measures in DBMS.

PART C — (1 × 15 = 15 marks)

16. (a) Consider the transactions T1, T2, and T3 and the schedules S1 and S2 given below.

T1: r1(X); r1(Z); w1(X); w1(Z)

T2: r2(Y); r2(Z); w2(Z)

T3: r3(Y); r3(X); w3(Y)

S1: r1(X); r3(Y); r3(X); r2(Y); r2(Z);
w3(Y); w2(Z); r1(Z); w1(X); w1(Z)

S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);
r2(Z); w3(Y); w1(X); w2(Z); w1(Z)

- (i) Which Schedule is conflict-serializable ? Give reasons. (6)
(ii) Explain the concepts of serial, non-serial and conflict-serializable schedules with examples. (9)

Or

- (b) XYZ Dental Hospital maintains the following table of data to keep history of the doctors, patients and their appointment details. Over time, the given table has grown to have thousands of records, and the chief of the hospital wants to store this data in a database efficiently.

DentistNo	DentistName	PatientNo	PatientName	Appointment Data and Time	Surgery No
S1011	Tony Smith	P100	White	12-Aug-03 10.00	S10
S1011	Tony Smith	P105	Jill Bell	13-Aug-03 12.00	S15
S1024	Helen Pearson	P108	Ian Mackay	12-Sep-03 10.00	S10
S1024	Helen Pearson	P108	Ian Mackay	14-Sep-03 10.00	S10
S1032	Robin Plevin	P105	Jill Bell	14-Oct-03 16.30	S15
S1032	Robin Plevin	P110	John Walker	15-Oct-03 18.00	S13

Perform the following.

- (i) Identify the primary key for the above table and state anomalies found in this table. (5)
(ii) List all functional dependencies among attributes (3)
(iii) Normalize the table so that all resulting tables are in 2NF stating the definitions of various normal forms. (7)