



B.TECH. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

INFORMATION TECHNOLOGY

U18ITI4303: Database Management Systems

COURSE OUTCOMES

- CO1:** Outline an ER model for a defined problem.
- CO2:** Explain the basic concepts of query processing and query optimization algorithms.
- CO3:** Describe the concepts of transaction and storage management.
- CO4:** Explain the basic concepts of database security and NoSQL.

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)**

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|--|-----|-------------------|
| 1. Differentiate DDL and DML. | CO1 | [K ₂] |
| 2. List the three basic concepts in ER model. | CO1 | [K ₁] |
| 3. Mention the six basic operators in relational algebra. | CO2 | [K ₂] |
| 4. Give suitable example for lossless decomposition. | CO2 | [K ₂] |
| 5. Compare static and dynamic hashing. | CO2 | [K ₂] |
| 6. Identify the factors to choose the RAID level. | CO2 | [K ₁] |
| 7. Test the following Schedule for view serializability. R1(A), R2(B), W3(A), W1(A), W2(B), R1(C) | CO3 | [K ₂] |
| 8. Define ACID properties. | CO3 | [K ₁] |
| 9. What is meant by SQL injection? | CO4 | [K ₂] |
| 10. How does column-oriented database work? | CO4 | [K ₂] |

**Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)**

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|--|-----|-----|-------------------|
| 11. a) Draw the schema diagram for College Management System. | (8) | CO1 | [K ₃] |
| b) Draw the Entity-Relationship diagram for Hospital Management System with minimum 5 entities. Convert ER to relations and justify selected attributes and key assignments. | (8) | CO1 | [K ₃] |

12. a) Consider the following 'University' database. (8) CO2 [K3]

Students(sid, sname, address)

Departments(deptid, dname, year_of_establishment)

Course(course_code, coursename, credit)

Course_registration(sid, deptid, course_code)

Develop SQL statements to do the following:

(i) Find the count of students registered for various courses offered.

(ii) Name(s) of the department which exist more than 10 years.

(iii) Find the names of students which starts with alphabet 'a'.

(iv) Find the 'sids' who have not done any course registration.

b) (i) Consider the join of a relation R with a relation S. If R has m tuples and S has (8) CO2 [K3]

n tuples then find the maximum and minimum tuples of the Natural join.

(ii) Consider a database that has the relation schema CR (Student Name, Course Name). An instance of the schema CR is as given below.

| Student Name | Course Name |
|--------------|-------------|
| SA | CA |
| SA | CB |
| SA | CC |
| SB | CB |
| SB | CC |

The following query is made on the database.

$$T1 \leftarrow \pi_{CourseName} (\sigma_{StudentName=SA} (CR))$$
$$T2 \leftarrow CR \div T1$$

Find the number of rows in T2.

(iii) Suppose we have a database consisting of the following three relations:

FREQUENTS (CUSTOMER, HOTEL)

SERVES (HOTEL, SNACKS)

LIKES (CUSTOMER, SNACKS)

The first indicates the hotels each customer visits, the second tells which snacks each hotel serves and last indicates which snacks are liked by each customer.

Express the following query in relational algebra: Print the hotels that serve the snack that customer Rama likes.

13. a) (i) Consider relation R(A,B,C,D,E) with following functional dependencies (8) CO2 [K₃]
 $AB \rightarrow C$, $D \rightarrow E$, $AB \rightarrow E$, $E \rightarrow C$. Find the minimal cover for relation R.

ii) The relation schema Student_performance (name, courseNo, rollNo, grade) has the following functional dependencies:

name, courseNo \rightarrow grade

rollNo, courseNo \rightarrow grade

name \rightarrow rollNo

rollNo \rightarrow name

Normalize the Student-performance relation to BCNF.

- b) . Convert the following table into 3NF (8) CO2 [K₃]

| Roll_no | Course | Student_N ame | Course _Name | Grade | Faculty | Phone_no |
|---------|---------|------------------|-----------------|-------|---------|----------|
| 1 | 20ALT31 | A | DBMS | A | X | 1234 |
| 1 | 20ALT32 | A | DAA | B | Y | 1122 |
| 2 | 20ALT31 | B | DBMS | A | X | 1234 |
| 3 | 20ALT31 | C | DBMS | B | X | 1234 |
| 4 | 20ALT32 | D | DAA | A | Y | 1122 |
| 4 | 20ALT31 | D | DBMS | B | X | 1234 |

14. a) Compare Dense Index and Sparse Index with example. (8) CO2 [K₂]

- b) . Insert the following key values in hash table using dynamic hashing technique. (8) CO2 [K₃]
 Keys are 34,24,39,46,70,7,44,60,25,61. Consider the bucket size is 3 and the hash function is key mod 22.

15. a) Draw the transaction state transition diagram and explain the components in it. (8) CO3 [K₂]

- b) Consider the following non-serial schedule S (8) CO3 [K₃]

R1(A), W3(A), R4(C), R1(C), R2(D), W2(B), W3(D), R2(E)

Test the above schedule for Conflict serializability. If the schedule S is conflict serializable then show the possible order of execution of Transactions.

16. a) Differences between DAC and MAC. (8) CO4 [K₂]

- b) What are CRUD operations? Why CRUD operations are important? Identify the benefits of it. (8) CO4 [K₂]
