Exam Date & Time: 27-Jul-2022 (02:00 PM - 05:00 PM)

# MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, JULY-AUG 2022

**DATABASE SYSTEMS [CSE 2251]**

**Marks: 50** **Duration: 180 mins.**

**A**

**Answer all the questions.**

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Illustrate the following disadvantages of keeping organizational information in file systems with necessary examples:

A) a. Data redundancy and inconsistency

b. Difficulty in accessing data

c. Integrity problems

d. Atomicity

e. Concurrent-access problems (5)

B) Give BCNF Decomposition Algorithm. Apply the algorithm, considering F as F+, to the following relation R with the given set of functional dependencies F and candidate key CK: (3)

R(A,B,C,D,E,F,G,H,I,J,K) , F={A→ BCD; HI→J; AEFG→HIK}, CK={AEFG}

C) Danger in natural join is unrelated attributes with the same name getting equated incorrectly. How could we address this using 'join…using( )' construct? Illustrate with an example. (2)

2) Suppose that we are using extendable hashing on a file that contains records with the following search-key values: 18, 19, 21, 23, 27, 33, 35, 39, 45, 47.

A) a. Show the extendable hash structure for this file if the hash function is h(x) = x mod 8 and buckets can hold three records. (5)

b. Show how the extendable hash structure created above, changes after executing each of the following steps: i) Delete 27. Ii) Delete 47. Iii) Insert 17. iv) Insert 31.

B) What is a serializable schedule? Why a serializable schedule is considered correct? Give the Conflict equivalent serial schedule, if any, for the following schedules given below. (3)

| **Schedule S1** | | **Schedule S2** | |
|---|---|---|---|
| **T1** | **T2** | **T1** | **T2** |
| Read(A) | | Read(A) | |
| Write(A) | | | Write(A) |
| | Read(A) | Write(A) | |
| | | | |

| | | | |
|---|---|---|---|
| Read(B) | | | Read(A) |
| | Write(A) | | |
| Write(B) | | | |
| | Read(B) | | |
| | Write(B) | | |

C) What is the need for variable-length records in database systems? How can we represent variable-length records? (2)

3) What is meant by canonical cover? Obtain the Canonical cover for the following set of functional dependencies for relational schema R(p,q,r,s) and F={ q → p, ps → qr, r → pqs } (5)

A)

B) Consider schema R(A,B,H,I). Given the multivalued dependencies

F = { A →→ H, B →→ HI }

Check if R is in 4NF, if not decompose R. (3)

C) Consider instructor relation given by schema instructor(ID,name,department,salary)

The users are expected to be querying as below:

**select ID, department**

**from instructor**

**where salary< 10000 and salary>5000;** (2)

As a database designer which indexing do you prefer? Justify your answer.

4) Consider the relational schema as given below and write relational algebra expressions for the given queries:

A) Employee (Fname, Mname, Lname, address, salary, Dnumber)

Department (Dname, Dnumber)

a. Find all employees who work in Dnumber 6 and have salary >80000

b. Retrieve the Fname, Lname and address of all employees who work for the 'Research' department. (5)

c. Retrieve the details of employees who have more than two dependents.

d. Find the average salary of employees in each department.

B) How to check whether the given relation R is in 4 NF? Illustrate in detail. (3)

C) Consider the relations r(R) and s(S), What does the following relational algebra expression denote? Explain with an example. (2)

$\Pi$ R $\cup$ S ( $\sigma$ r.A1=s.A1 $\wedge$ r.A2=s.A2 $\wedge$ . . . $\wedge$ r.An=s.An (r x s)))

5) Consider the University Database Schema and answer the following queries in SQL:

A)

department(deptname, building, budget)

course(courseid, title, deptname, credits)

instructor(ID, name, deptname, salary)

section(courseid, secid, semester, year, building, roomnumber, time_slot id)

teaches(InstructorID, courseid, secid, semester, year)

student(ID, name, deptname, totcred)

(5)

a. Display a list of all instructors, showing their ID, name, and the number of sections that they have taught.

b. Display the list of all course sections offered in Spring 2010, along with the names of the instructors teaching the section.

c. Display the list of all departments, with the total number of instructors in each department, without using scalar subqueries.

B) Write the following inserts, deletes or updates in SQL, using the University schema given in Q5A.

a. Increase the salary of each instructor in the Comp. Sci. department by 10%.

b. Delete all courses that have never been offered (that is, do not occur in the section relation). (3)

c. Insert every student whose tot cred attribute is greater than 100 as an instructor in the same department, with a salary of $10,000.

C) Differentiate between Relation and Relation schema with an example? (2)

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