18CS53

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Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Database Management System

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. List out and discuss the main characteristics of the database approach and how it differs from traditional file systems. **(10 Marks)**

    b. What is the goal of three-schema architecture? How it is defined at different levels? **(05 Marks)**

    c. When will the recursive relationship be used? Explain it with some examples. **(05 Marks)**

OR

2   a. A university databse contains information about professors (identified by a SSN) and courses (identified by a course ID). Each of the following situations concerns the relationship set between the teacher and the student. Draw an ER diagram for each situation (assuming that no further constraints hold).
    i)   Professors can teach the same course over several semesters and each offering must be recorded.
    ii) Each professor teaches exactly one course.
    iii) Each professor teaches at least one course and some professors teach multiple courses.
    iv) Each professor teaches at least one course and some processors must teach all the courses. **(10 Marks)**

    b. What is the difference between logical and physical data independence? Which one is harder to achieve? Why? **(05 Marks)**

    c. Discuss the advantages that must to be utilized by the DBA. **(05 Marks)**

Module-2

3   a. Justify the following statements:
    i)   Handling null values is difficult
    ii) Relations must have a key
    iii) Weak entities do not have their own key attributes. **(06 Marks)**

    b. Find the results of these expressions for the relational schema R and S.

R		
A	B	C
1	2	3
2	2	5
3	4	1
4	2	3

S		
C	D	E
1	2	4
3	4	1
5	1	6
4	2	3

    i) $R \cup S$
    ii) $R \cap S$
    iii) $R - S$
    iv) $R \bowtie S$
       $R.A = S.C$
    v) $R \underset{R.B = S.D}{\bowtie} S$ **(10 Marks)**

    c. How does SQL implement the entity integrity constraints of the relational data model? **(04 Marks)**

OR

4   a.   How are the OUTER JOIN operations different from the INNER JOIN operations?
(04 Marks)

b.   Outline the steps to convert the basic ER model to relational database scheme.   (10 Marks)

c.   Consider the following tables:

Works (Pname, Cname, Salary)   Pname = Person Name
LIVES (Pname, Street, City)   Cname = Company Name
LOCATED-IN (Cname, City)   Mgrname = Manager Name
MANAGER (Pname, Mgrname)

Write the SQL for the following:
i)   Find the names of the persons who live and work in same city.
ii)   Find the names of the persons whose salary is more than that all of the 'oracle' employees.
iii) List the names of the people who work for the company 'Wipro' along with the city they live in.   (06 Marks)

Module-3

5   a.   Consider the following database:
Employee (Name, SSN, address, salary, superssn, dno)
DEPT (Dname, Dno, mgr_ssn)
PROJECT (Pname, Pno, ploc, Dnum)
WORKS_ON (ESSN, pno, Hours)
DEPENDENT (ESSN, DepName, relationship).
Write the SQL query for the following:
i)   For each project on which more than 2 employees work, retrieve the project no, project name and the number of employees who work on the project.
ii)   Retrieve the names of all employees who have 2 or more dependents.
iii) Retrieve the names of all employees who do not have supervisors.
iv)   Retrieve name of each employee who work on all projects controlled by dept. No5.
v)   Create a view which can retrieve dept, Name, no of employees and total salary of the dept.   (10 Marks)

b.   When are stored procedures useful? Give an example.   (05 Marks)

c.   Explain the three-tier application architecture.   (05 Marks)

OR

6   a.   Explain SQL triggers with examples.   (06 Marks)

b.   Explain various JDBC classes and interfaces available with the sample code.   (06 Marks)

c.   Consider the database given in Q.No.5a. Write the SQL for the following:
i)   Retrieve the number of employees in 'CSE' department.
ii)   Retrieve the names of managers who do not have dependents.
iii) Retrieve the names of employees who do not work on any project.
iv)   List the names of all employees who are directly supervised by 'Anil'.   (08 Marks)

Module-4

7   a. Why should NULLs in a relation be avoided as far as possible? Discuss the problem of spurious tuples and how we may prevent it.   (06 Marks)

   b. Consider the following for published books:
       Book (Btitle, author-name, Btype, Listprice, Author-Aft, publisher)
       Btitle → publisher, Btype
       Btype → listprice
       Author_name → author-aff
       What is the key?
       i)   What normal form is the relation in? Explain your answer.
       ii) Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.   (08 Marks)

   c. Define 5NF. Why 5NF is also called as PJNF?   (06 Marks)

OR

8   a. Consider the following decomposition for the relation shema R.
       Determine whether each decomposition has lossless join property with respect to F. Also determine which normal form each relation in the decomposition is in.
       $D = \{R_1, R_2, R_3, R_4, R_5\}$, $R_1 = \{A, B, C, D\}$, $R_2 = \{D, E\}$, $R_4 = \{F, G, H\}$, $R_3 = \{B, F\}$,
       $R_5 = \{D, I, J\}$, $F = \{(A, B) \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}, \{D\} \rightarrow \{I, J\}\}$.
                                                                                  (08 Marks)

   b. Discuss the purpose of Boyce-Codd normal form. Describe how BCNF differs from and is stronger than 3NF. Illustrate your answer with an example.   (06 Marks)

   c. List and narrate the informal guidelines for a relational schema design.   (06 Marks)

Module-5

9   a. Explain in detail the desirable properties of transactions.   (06 Marks)

   b. Describe 2 phase locking techniques for concurrency control.   (10 Marks)

   c. State and explain two-phase commit protocol.   (04 Marks)

OR

10 a. Describe the 3 phases of the ARIES recovery method.   (06 Marks)

   b. List the different deadlock prevention schemes.   (06 Marks)

   c. Draw a state diagram and discuss the typical states that a transaction goes through during execution.   (08 Marks)

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