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(Pages : 4) **M – 6112**

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, December 2021

13.405 DATA BASE DESIGN (FR)

(2013 Scheme)

Time : 3 Hours Max. Marks : 100

PART – A

Answer all questions. Each question carries **4** marks.

1. Discuss the capabilities that should be provided by a DBMS.
2. Discuss the naming conventions used for ER schema diagrams.
3. How are the OUTER JOIN operations different from the INNER JOIN operations? How is the OUTER UNION operation different from UNION?
4. What is the lossless join property of a decomposition? Why is it important?
5. Explain heuristic based query optimization.

(5 × 4 = 20 Marks)

PART – B

Answer **any one** question from each module. Each question carries **20** marks.

Module — I

6. (a) What are the responsibilities of the DBA and the database designers? **6**

   (b) Discuss the main characteristics of the database approach and how it differs from traditional file systems. **8**

   (c) Explain the situations in which a DBMS may involve unnecessary overhead costs that would not be incurred in traditional file processing. **6**

OR

P.T.O.

7. (a) Explain with example (for each) reduction of the following E-R diagram features to Relational Database Schema.

(i) Weak Entity

(ii) Many to One Relationship. 8

(b) Design an ER schema for keeping track of information about votes taken in the U.S.House of Representatives during the current two-year congressional session. The database needs to keep track of each U.S. STATE's Name (e.g., 'Texas', 'New York', 'California') and include the Region of the state (whose domain is {'Northeast', 'Midwest', 'Southeast', 'Southwest', West}). Each CONGRESS_PERSON in the House of Representatives is described by his or her Name, plus the District represented, the Start_date when the congressperson was first elected, and the political Party to which he or she belongs (whose domain is {'Republican', 'Democrat', 'Independent', 'Other'}). The database keeps track of each BILL (i.e., proposed law), including the Bill_name, the Date_of_vote on the bill, whether the bill Passed_or_failed

(whose domain is {'Yes', 'No' }), and the Sponsor (the congressperson(s) who sponsored-that is, proposed—the bill). The database also keeps track of how each congressperson voted on each bill (domain of Vote attribute is {'Yes, No', 'Abstain', Absent'}). Draw an ER schema diagram for this application. State clearly any assumptions you make. 12

Module — II

8. (a) What is the difference between a key and a superkey? Why do we designate one of the candidate keys of a relation to be the primary key? 6

(b) Consider the following library database schema. Give an expression in the relational algebra to express each of the following queries:

Book(Book_id, Title, Publisher)

Publisher(Name,Address,phone)

Book_copies(Book_id,Branch_id,No_of_copies)

Library_branch(Branch_id, Branch_name,Address)

Borrower(card_number, name,address)

Book_loan(Book_id,Branch_id, cardno,dateout,duedate)

(i) How many copies of the book titled The Lost Tribe are owned by the library branch whose name is "Sharpstown"?

(ii) How many copies of the book titled The Lost Tribe are owned by each library branch?

(iii) Retrieve the names, addresses, and number of books checked out for all borrowers who have more than five books checked out.

(iv) Find the total number of books borrowed in each branch. **3+3+4+4**

OR

9. (a) Discuss how Trigger constructs is used in SQL, and discuss the various options for the construct. Specify what each construct is useful for. **6**

(b) Consider the following airline database.

Flights (flno, from, to, distance, departs)

Aircraft (aid, aname, range)

Certified (eid, aid)

Employees (eid, ename, salary)

Write SQL for each of the following queries.

(i) Find names of pilots who are certified on some Boeing.

(ii) Find eid of employee(s) with the second highest salary.

(iii) Find the aircraft id of the aircraft for which every pilot is eligible whose salary is over $100,000.

(iv) Find the employee with highest number of certification.

3+3+4+4

Module — III

10. (a) Discuss insertion, deletion, and modification anomalies. Why are they considered bad? Illustrate with examples. **10**

(b) Consider the relation $R(P,Q,R,S,T,U)$ and the set F of functional dependencies $F=\{P\rightarrow Q, R\rightarrow SU, PR\rightarrow T, S\rightarrow U\}$

(i) What is the key of the relation and why?

(ii) What is the highest normal form. Prove it.

(iii) If it is not in 3NF then find a decomposition that is lossless and dependency preserving. **10**

OR

11. (a) Write an algorithm to check if a dependency $\alpha \rightarrow \beta$ is preserved. Given $R=(A, B, C)$ $F=\{A \rightarrow B\ B \rightarrow C\}$ Key $=\{A\}$. Check whether the following decomposition is lossless and dependency preserving.

(i) $R_1=(A, B)$, $R_2=(B, C)$

(ii) $R_1=(A, B)$, $R_2=(A, C)$. 8

(b) Give an algorithm To compute the closure of a set of functional dependencies F:

Given $R=(A,B,C,G,H,I)\ F=(A \rightarrow B,\ A \rightarrow C,\ CG \rightarrow H),\quad CG \rightarrow I, B \rightarrow H\}$

Compute F^+. 6

(c) State the informal guidelines for relation schema design. Illustrate how violation of these guidelines may be harmful. 6

Module — IV

12. (a) What are the differences among primary, secondary, and clustering indexes? How do these differences affect the ways in which these indexes are implemented? Which of the indexes are dense, and which are not? 6

(b) Discuss the reasons for converting SQL queries into relational algebra queries before optimization is done. What is a query execution plan? 8

(c) What are the reasons for transaction failures and why recovery is required? 6

OR

13. (a) Show that the two-phase locking protocol ensures conflict serializability, and that transactions can be serialized according to their lock points. 10

(b) How B tree diffusion from B^+ sec. Explain B tree in detail 10

(4 × 20 = 80 Marks)