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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**
Course Code: 22AM3PCDBM **Max Marks: 100**
Course: Database Management Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Consider the following company database to answer the following queries: **10**

emp (eno, ename, bdate, title, salary, dno)
proj (pno, pname, budget, dno)
dept (dno, dname, mgreno)
workson (eno, pno, resp, hours)

i. Write an SQL query that returns the employee name, project name, employee title, and hours for all works on records.
ii. Write an SQL query that returns the employee numbers and salaries of all employees in the "Consulting" department ordered by descending salary.
iii. Write an SQL query that returns the project name, department name, and budget for all projects with a budget < $50,000.
iv. Write an SQL query that returns the project name, hours worked, and project number for all works on records where hours > 10.
v. Write an SQL query that returns the employees (name only) in department "D1" ordered by decreasing salary.

b) Discuss the main categories of data models. Differentiate the following: **10**
i Relational model and object model ii. Database schema and a database state

OR

2 a) Elaborate different types of user-friendly database languages and interfaces and the types of users who typically use each. **10**

b) Consider the salesman database to answer the following questions: **10**

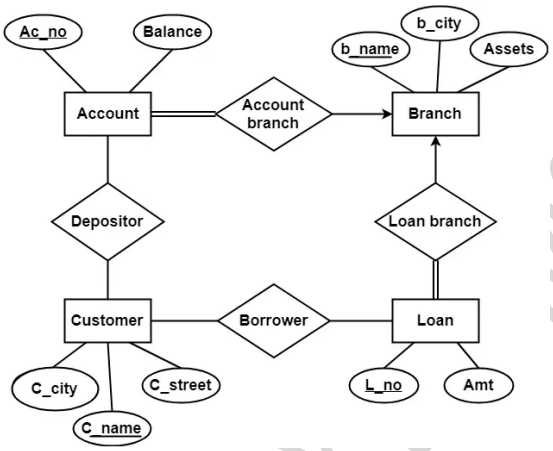
Salesman(Salesman_id, Name, City, Commision)
Customer((Cust_id,Cust_name,City,Grade)
Order(Order_no,Purchase_amt,Order_date,Customer_id,salesman_id)

i. Find those salesmen with all information who gets the commission within a range of 0.12 and 0.14.
ii. Find the name and city of those customers and salesmen who lives in the same city.
iii. Find the names of all customers along with the salesmen who works for them.
iv. Display all those orders by the customers not located in the same cities where their salesmen live.
v. Display all the orders issued by the salesman "Paul Adam" from the orders table.

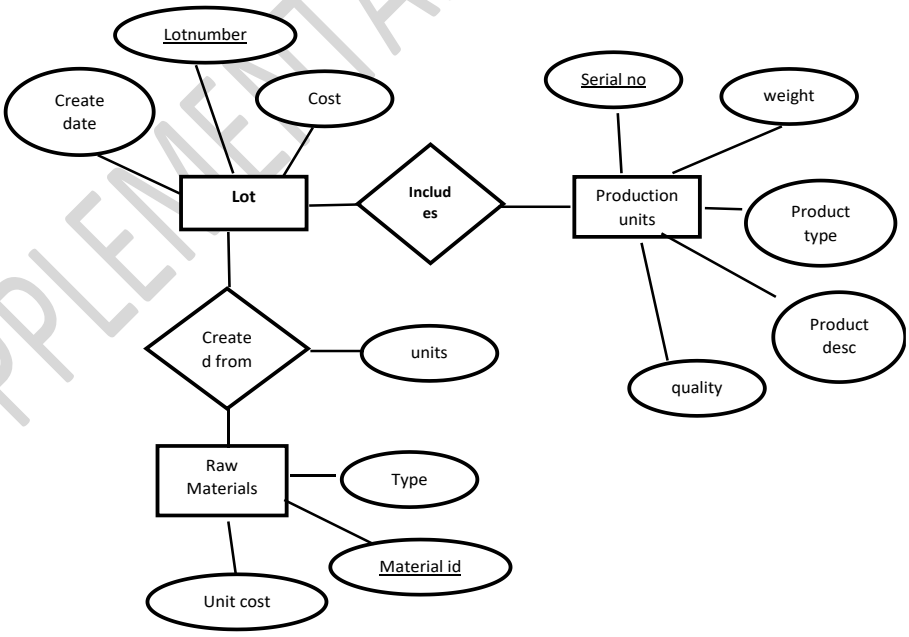
UNIT – II

3 a) A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game and the result of the game. Design an ER diagram and schema for this application, stating any assumptions you make. Choose your favorite sport (e.g Cricket, Baseball, Football). Make sure the database comprise primary keys, cardinality ratio, derived attributes and week entities. **10**

b) Find the minimum number of tables and their attributes required to represent the given ER diagram in relational model. **5**



c) Convert the ER diagram into a relational database schema. Be certain to indicate primary keys and referential integrity constraints. **5**



UNIT – III

4 a) Consider a database with the following schema: **10**

Person (name, age, gender) name is a key
Frequents (name, pizzeria) (name, pizzeria) is a key
Eats (name, pizza) (name, pizza) is a key
Serves (pizzeria, pizza, price) (pizzeria, pizza) is a key

Answer the following questions using relational algebra queries:

i. Find all pizzerias frequented by at least one person under the age of 18.
ii. Find the names of all females who eat either mushroom or pepperoni pizza (or both).
iii. Find the names of all females who eat both mushroom and pepperoni pizza.
iv. Find all pizzerias that serve at least one pizza that Amy eats for less than $10.00.

For each person, find all pizzas the person eats that are not served by any pizzeria the person frequents. Return all such person (name) / pizza pairs.

b) Consider a relation R(A, B) that contains r tuples, and a relation S(B, C) that contains s tuples; assume r > 0 and s > 0. Make no assumptions about keys. For each of the following relational algebra experssions, state in terms of r and s the minimum and maximum number of tuples that could be in the result of the expression. **5**

a. $R \cup \rho_{S(A,B)} S$

b. $\pi_{A,C}(R \bowtie S)$

c. $\pi_B R - (\pi_B R - \pi_B S)$

d. $(R \bowtie R) \bowtie R$

e. $\sigma_{A>B} R \cup \sigma_{A<B} R$

c) "Relations on which UNION, INTERSECTION, and DIFFERENCE operations are applied has to be union compatible**".** Justify the statement with suitable examples for each. **5**

UNIT - IV

5 a) Discuss four informal guidelines with examples that may be used as measures to determine the quality of relation schema design. **10**

b) Consider the following relation schema Membership for a library database: **10**

Membership (MID, Name, Address, PhoneNum, ParentMID, ISBN, Title, Authors, BorrowDate, ReturnedDate, FineDue, FinePaid).

Here, ParentMID may have the values Null, Father_Name, Mother_Name or both.

The following is the set F of functional dependencies that hold in Membership table;

MID → Name, Address, PhoneNum, ParentMID;

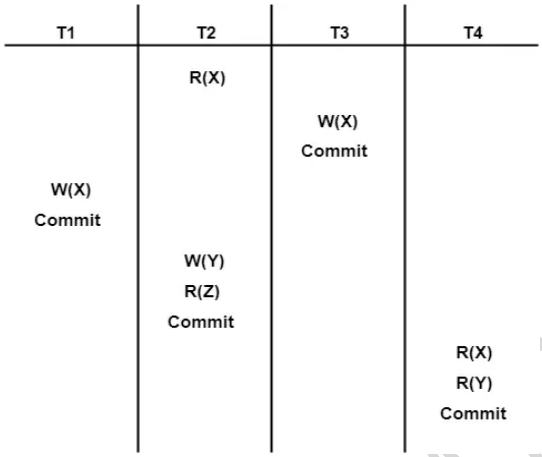
(MID, ISBN, BorrowDate) → ReturnedDate, FinePaid, FineDue;

ISBN → Title, Authors

Normalize the Membership schema to 3NF and show the steps.

UNIT - V

6 a) Discuss types of recoverability of schedules. Check whether the given schedule S is conflict serializable and recoverable or not- **10**



b) Define concurrent execution of database transactions in a multiuser system? Discuss the need of concurrency control and give informal examples. **10**

OR

7 a) During execution, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass. Explain why each state transition may occur. **10**

b) Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). **10**

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

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

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

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

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

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