OR iv. Consider the following relational database schema consisting of relation schemas: **5**

Salesman(Salesman_id, name , city , commission)
Customer (Customer_id, name , city , grade, Salesman_id)
Order(order_no, purchase _amount, orderdate, Customer_id, Salesman_id)
Answer the following questions using SQL queries:

(a) Display names and city of salesman, who belongs to the city of Paris
(b) Find that customer with all information who does not get any grade except NULL
(c) Find the name and city of those customers and salesmen who lives in the same city
(d) Display all the orders issued by the salesman 'Paul Adam' from the orders table
(e) Find all orders attributed to salesmen in Paris

Q.4 i. Give R(ABCDE) and set of functional dependency- **4**
FD = { A → B, B → C, C → D , D → A}
The question is to calculate the candidate key and no. of candidate key, prime attributes and non-prime attributes in above relation R using a given set of FDs.

ii. What are integrity constraints and what is the need of these constraints in database? Explain all along with suitable example. **6**

OR iii. Explain the following with example: **6**
(a) Functional dependency (b) BCNF
(c) Multivalued dependency

Q.5 i. What is transaction? Explain state of transaction with a neat state diagram. **4**

ii. What is a precedence graph? What is a conflict serializable schedule? Can precedence graph be used to detect a conflict serializable schedule? **6**

OR iii. Explain the need of concurrency control and locking protocols. How many locks are available? Explain anyone locking protocol. **6**

Q.6 Attempt any two:

i. What is distributed database? Explain its advantages. **5**

ii. Write short note on data mining and warehousing. **5**

iii. What is meant by heuristic optimization? Discuss the main heuristics that are applied during query optimization. **5**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering / Science
End Sem Examination May-2024
CS3CO39 / BC3CO65 / BC3CO45
Database Management Systems

Programme: B.Tech. / B.Sc. Branch/Specialisation: CSE All

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Database _____ which is the logical design of the database, and the database _____ which is a snapshot of the data in the database at a given instant in time. **1**
(a) Instance, schema (b) Relation, schema
(c) Relation, domain (d) Schema, instance

ii. Let E be an entity set in a relationship set R. If every entity in E participates in at least one relationships in R, Then the participation of E in R is _____. **1**
(a) Partial (b) Total
(c) Complete (d) Incomplete

iii. The select operation's function in relational algebra is identical to the _____ clause in SQL. **1**
(a) where (b) from (c) select (d) None of these

iv. Πcustomer_name, loan_number, amount (borrower ⋈loan), What does the above expression perform? **1**
(a) It finds the customer_name, loan_number and amount from borrower
(b) It finds the customer_name, loan_number and amount from loan
(c) It finds the customer_name, loan_number and amount from the full outer join of borrower and loan
(d) It finds the customer_name, loan_number and amount from join of borrower and loan

v. The main task carried out in the _____ is to remove repeating attributes to separate tables. **1**
(a) First normal form (b) Second normal form
(c) Third normal form (d) Fourth normal form

vi. What is a foreign key? **1**

(a) A foreign key is a primary key of a relation which is an attribute in another relation

(b) A foreign key is a super key of a relation which is an attribute in more than one other relations

(c) A foreign key is an attribute of a relation that is a primary key of another relation

(d) A foreign key is the primary key of a relation that does not occur anywhere else in the schema

vii. A transaction can proceed only after the concurrency control manager **1**
_____ the lock to the transaction.

(a) Grants (b) Requests (c) Allocates (d) None of these

viii. The situation where no transaction can proceed with normal execution is **1**
known as _____.

(a) Road block (b) Deadlock

(c) Execution halt (d) Abortion

ix. A technique for direct search is- **1**

(a) Binary search (b) Linear search

(c) Tree search (d) Hashing

x. What are the correct features of a distributed database? **1**

(a) Is always connected to the internet

(b) Always requires more than three machines

(c) Users see the data in one global schema

(d) Have to specify the physical location of the data when an update is done

Q.2 i. Explain three level schema architecture of DBMS. **4**

ii. Assume we have the following application that models soccer teams, the games they play, and the players in each team. In the design, we want to capture the following: **6**

(a) We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.

(b) Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.

(c) Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.

(d) For each match we need to keep track of the following:

o The date on which the game is played

o The final result of the match

o The players participated in the match. For each player, how many goals he scored

(e) Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design. Make sure cardinalities and primary keys are clear.

OR iii. A university registrar's office maintains data about the following entities: **6**

(a) Courses, including number, title, credits, syllabus, and prerequisites;

(b) Course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;

(c) Students, including student-id, name, and program; and

(d) Instructors, including identification number, name, department, and title.

Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.

Q.3 i. What is view? **2**

ii. Differentiate between relational algebra and relational calculus. **3**

iii. Consider the following relational database schema consisting of the four relation schemas: **5**

passenger (pid, pname, pgender, pcity)
agency (aid, aname, acity)
flight (fid, fdate, time, source, destination)
booking (pid, aid, fid, fdate)

Answer the following questions using relational algebra queries: -

(a) Get the details about all flights from Chennai to New Delhi.

(b) Find the details of all male passengers who are associated with 'Jet agency'.

(c) Find the passenger names for passengers who have bookings on at least one flight.

(d) Find flight details of a passenger whose name is "Ram Sharma".

(e) List all passenger name who have booked a flight from 'Mumbai' to 'Delhi'.

Scheme of Marking
Data Base Management Systems - CS3CO39

Q.1 i) Database _____ which is the logical design of the database, and the database _____ which is a snapshot of the data in the database at a given instant in time. **1**

d) Schema, Instance

ii) Let E be an entity set in a relationship set R. If every entity in E participates in at least one relationships in R, Then the participation of E in R is _____ **1**

b) Total

iii) The select operation's function in relational algebra is identical to the _____ clause in SQL **1**

a) where

iv) Πcustomer_name, loan_number, amount (borrower ⋈loan) **1**
What does the above expression perform?

d) It finds the customer_name, loan_number and amount from join of borrower and loan

v) The main task carried out in the _____ is to remove repeating attributes to separate tables. **1**

a) First Normal Form

vi) What is a foreign key? **1**

c) A foreign key is an attribute of a relation that is a primary key of another relation

vii) A transaction can proceed only after the concurrency control manager _____ the lock to the transaction **1**

a) Grants

viii) The situation where no transaction can proceed with normal execution is known as _____ **1**

b) Deadlock

ix) A technique for direct search is **1**

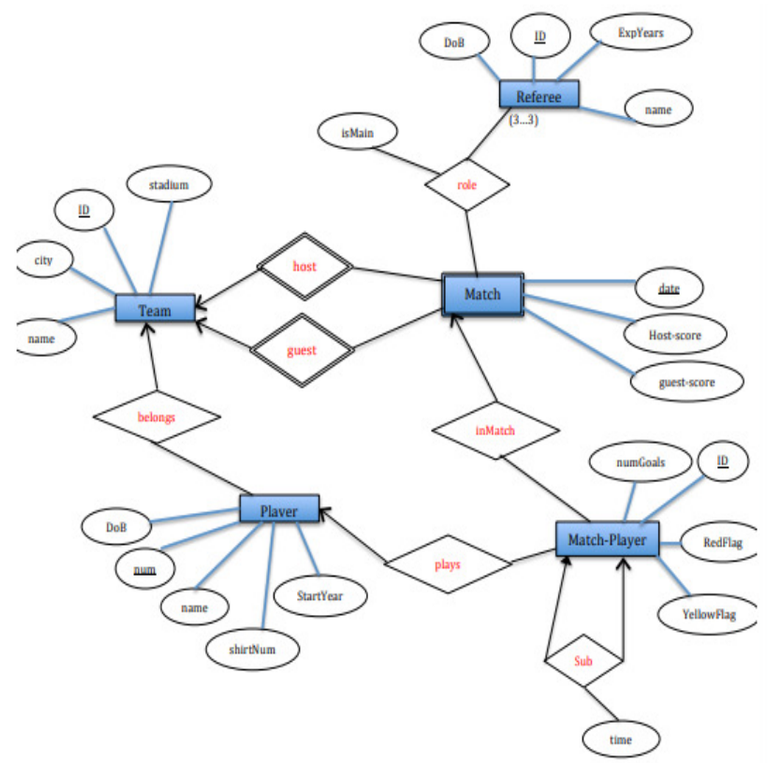
d) Hashing

x) What are the correct features of a distributed database? **1**

c) Users see the data in one global schema.

Q.2 i. Explain three level schema architecture of DBMS. **4**

ii. **6**



Assumptions:

1- In Match-Player entity set, we added a unique identifier for each record ID.
2- The final result in Match entity set is captured using two attributes Host-score and guest-score
3- The attribute 'isMain' in relationship 'role' is true if the referee is the main referee in the match, otherwise, it will be false.

OR iii. **6**

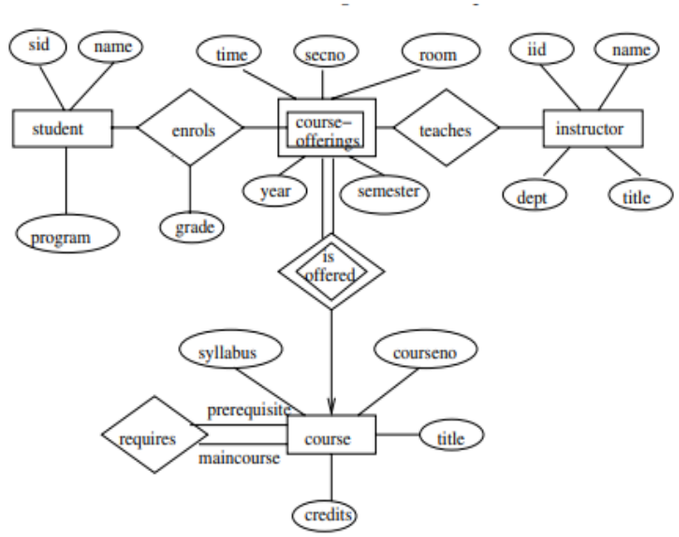


Figure 2.3 E-R diagram for a university.

Q.3 i. view **2**

ii. 3 Difference between Relational algebra and Relational Calculus. **3**

iii. Consider the following relational database schema consisting of the four relation schemas: **5**
passenger (pid, pname, pgender, pcity)
agency (aid, aname, acity)
flight (fid, fdate, time, source, destination)
booking (pid, aid, fid, fdate)
Answer the following questions using relational algebra queries: -
1.Get the details about all flights from Chennai to New Delhi.

σ source =’chennai ‘ ^ destination=’new delhi ‘(flight)

2. Find the details of all male passengers who are associated with ‘Jet ‘agency.

Π passengers.pid, pname, pcity (σ pgender = “Male” ^ aname = ‘Jet’ (passengers ⋈ booking ⋈ agency))

3.Find the passenger names for passengers who have bookings on at least one flight.

Π pname (passenger ⋈ booking)

4. Find flight details of a passenger whose name is “Ram Sharma”.

Π fid, fdate, time source , destination (σ pname =’ram sharma’ (passengers ⋈ booking ⋈ flight))

5. List all passenger name who have booked a flight from ‘mumbai ‘ to ‘delhi’.

Π passengers.pid, pname, pcity (σ source = “Mumbai” ^ destination= “delhi” (passengers ⋈ booking ⋈ flight))

OR iv. Consider the following relational database schema consisting of relation schemas: **5**
Salesman(Salesman_id, name , city , commission)
Customer (Customer_id, name , city , grade, Salesman_id)
Order(order_no, purchase _amount , orderdate , Customer_id, Salesman_id)
Answer the following questions using SQL queries :-
1. Display names and city of salesman, who belongs to the city of Paris.
SELECT name,city FROM salesman WHERE city='Paris';

2. Find that customer with all information who does not get any grade except NULL.

SELECT * FROM customer WHERE grade IS NULL;

3. Find the name and city of those customers and salesmen who lives in the same city.

SELECT C.cust_name S.name S.city FROM salesman AS S customer AS C WHERE S.city = C.city;

4. Display all the orders issued by the salesman 'Paul Adam' from the orders table.

SELECT * FROM orders WHERE salesman_id = (SELECT salesman_id FROM salesman WHERE name = 'Paul Adam');

5. Find all orders attributed to salesmen in Paris.

SELECT * FROM orders WHERE salesman_id IN (SELECT salesman_id FROM salesman WHERE city ='Paris');

Q.4 i. Give R(ABCDE) and Set of Functional Dependency **4**
FD = { A → B, B → C, C → D , D → A}
The question is to calculate the candidate key and no. of candidate key, prime attributes and non-prime attributes in above relation R using a given set of FDs.

Candidate key is (AE, BE, CE AND DE)
Prime attributes are :- A,B,C,D,E
Non prime attributes :- null

ii. What are integrity constraints 2marks **6**
and what is the need of these constraints in database ? 2 marks
Explain all along with suitable example . 2 marks

OR iii. Explain the following with example :- **6**
1.Functional Dependency
2. BCNF
3. Multivalued Dependency

2 marks of each

Q.5 i. What is Transaction? 2 marks **4**
Explain state of transaction with a neat state diagram . 2 marks

ii. What is a precedence graph? **6**
What is a conflict serializable schedule?
Can precedence graph be used to detect a conflict serializable schedule?
2 marks of each

OR iii. Explain the need of concurrency control and locking protocols. **6**
2 marks
How many locks are available ? Explain any one locking protocol.
4 marks

Q.6 Attempt any two:

i. What is Distributed Database? Explain its advantages. **5**

ii. Write short note on Data mining and warehousing . **5**

iii. What is meant by heuristic optimization? Discuss the main heuristics that are applied during query optimization **5**

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