

Jan 2025

① With suitable example, explain the entity integrity and referential integrity constraints. Why each is considered important? (5 marks)

② Discuss equijoin and natural join with * suitable example using relational algebra notation (5 marks)

③ Given the relational tables: (10 marks)

Employee

EmpID	Name	DeptID	Salary
1	Alice	10	5000
2	Bob	20	6000
3	Eve	20	6500

Department

DeptID	DeptName
10	HR
20	IT
30	Sales

Project

ProjID	ProjectName	DeptID
101	Project Alpha	10
102	Project Beta	20
103	Project Gamma	30

Write relational algebra expression for all following

① Find the names and salaries of all employees

in the 'IT' department.

- ② Find the ID's and names of employees who are in the 'IT' department and have a salary greater than 6000.
- ③ Find the ID's and names of employees who are either in the 'HR' department or have a salary greater than 6000.
- ④ Find the names of employees who are not in the 'IT' department
- ⑤ Find the names of employees along with their department names.

✓ ④ Explain any two operations that change the state of relation in a database. Provide suitable examples.

⑤ Discuss the aggregation functions and grouping in relational algebra with suitable examples.

✓ ⑥ Given the relation tables:

Student		Project	
SID	Name	PID	Project Name
a	Alice	P	Alpha
b	Bob	q	Beta
c	Carol	r	Gamma

(2)

Language		Enrollment	
LID	Language Name	SID	PID
x	Python	a	P
y	Java	a	q
z	C++	b	q
		c	r

write relational algebra expression for the following

- ① Rename the student table to learner and display it
- ② Find the students (learners) who are not enrolled in any project.
- ③ Find the students who are enrolled in all projects.
- ④ Find the students who are not enrolled in any project.
- ⑤ Find the students who are enrolled in both the 'Alpha' and 'Beta' projects.

June / July 2024

- ⑦ Discuss the update operations and dealing with constraint violations with suitable examples.
- ⑧ Illustrate the relational algebra operators with examples for select and project operation.
- ⑨ Discuss the characteristics of relations that make them different from ordinary table and files.

- ⑩ Perform
- ① Student \cup instructor
 - ② Student \cap instructor
 - ③ Student - Instructor
 - ④ Instructor - Student

on the following tables

Student		Instructor	
Fname	Lname	Fname	Lname
Susan	Yao	John	Smith
Ramesh	Shah	Ricardo	Browne
Johnny	Kohler	Susan	Ma
Barbara	Jones	Francis	Johnson
Amy	Ford	Ramesh	Shan
Jimmy	Wang		
Ernest	Gilbert		

- ⑪ Consider the following relational database schema & write the queries in relational algebra expressions

EMP (Eno, Ename, Salary, Address, Phone, Dno)

DEPT (Dno, Dname, Dloc, MgrEno)

DEPENDENT (Eno, Dep, Name, Drelation, Dage)

- ① List all the employee who reside in 'Belagavi'
- ② List all the employee who earn salary b/w 30000 and 40000

- ③ List all the employees who work for the 'sales' department
- ④ List all the employees who have at least one daughter
- ⑤ List the department names along with the names of the managers. ③

⑫ Consider the two tables T_1 and T_2 shown below.

T_1		
P	Q	R
10	a	5
15	b	8
25	a	6

T_2		
A	B	C
10	b	6
25	c	3
10	b	5

Show the results of the following operations

① $T_1 \bowtie_{T_1.P = T_2.A} T_2$

② $T_1 \bowtie_{T_1.Q = T_2.B} T_2$

③ $T_1 \bowtie_{(T_1.P = T_2.A \text{ AND } T_1.R = T_2.C)} T_2$

June 2024 (Supplementary)

- ⑬ Briefly explain different types of update operation on relation database. Show an example of violation of referential and entity integrity in each of update operation.

- ⑭ Consider following schema
- Suppliers (SID, SName, address)
- Parts (PID, PName, Colour)
- Catalog (SID, PID, Price)

Write relational algebra expression for following queries

- ① Find the names of all red parts.
 - ② Find all prices for parts that were red or green.
 - ③ Find the SID's of all suppliers who supply part that is red or green.
 - ④ Find the SID's of all supplier who supply part that is red and green.
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- ⑤ Describe the steps of ER-to-relational mapping with suitable examples and schema for each step.
 - ⑥ Explain with example
 - ① Division operation
 - ② Full outer join
 - ③ Aggregate function
 - ④ Project operation
 - ⑤ Cartesian Product.
 - ⑦ List and explain the different characteristics of relations with suitable example for each.
 - ⑧ With an example, discuss the basic constraints that can be specified when you create a table in SQL.
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- ⑨ Write queries in relational algebra for the following
- Employee (Name, SSN, Salary, Superssn, Dno)
- Department (Dname, Dno, Mgrssn, Mgrstartdate)
- Project (Pname, Pno, Plocation, Dno)

Dept - Location (Dnum, Dlocation)

works-on (Essn, Pnum, Hours)

Dependent (Essn, Depname, Sex)

- ① Retrieve the number of dependents for an employee named "Ram"
- ② Retrieve the name of managers working in location named "XYZ" who has no female dependents.
- ③ Retrieve the name of employee who works in the same department as that of "Raj".

✓ Briefly discuss the different types of update operations or relational database. Give examples for the ~~violation~~ of referential integrity in each of the update operation. (Repeated)

With examples, explain the steps of ER to relational mapping algorithm. (Repeated)

20 ✓ Explain any four relational algebra operations with examples.

21 Write the relational algebra queries to perform the following on "Company database".

- ① Retrieve the name and address of all employees who work for "Research" department.
- ② Retrieve the names of employees, who have no dependents.

✓ (22) Explain the different constraints that can be applied during table creation in SQL, with an example.

(23) Design the SQL queries for the following database schema.

works (Pname, Cname, Salary)

Lives (Pname, Street, City)

Located-in (Cname, Lcity)

Manager (Pname, Mgrname)

- ① Find the names of all persons who lives in the city "Bengaluru".
- ② Find the names of all persons who lives and work in same city.
- ③ Find the sum of salaries of persons working in "wipro" company.
- ④ Find the names of all persons who work in "Infosys" and salary is b/w Rs 50,000 and Rs. 90,000.

✓ • Explain any 5 relational algebra operators along with their syntax and purpose. (Repeated)

• Explain the steps of an algorithm for

ER-to-relational mapping. (Repeated)

24) Explain the different Relational Model constraints.

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✓ Explain Entity Integrity constraint & Referential Integrity constraints? why each of these is important in a database

25) Consider the Sailors - Boats - Reserves DB described

S (sid, sname, rating, age)

B (bid, bname, color)

R (sid, bid, date)

write each of the following queries in SQL.

- ① Find the colors of boats reserved by Alber.
- ② Find all sailor ids of sailors who have a rating of at least 8 or reserved boat 103.
- ③ Find the names of sailors who have not reserved a boat whose name contains the string "storm" order the names in ascending order.
- ④ Find the sailor ids of sailors with age over 20 who has not reserved a boat whose name includes the string "thunder".

✓ 26) Explain the relational algebra operation for set theory with examples.

• Discuss the E-R to Relational mapping algorithm with example for each step.

✓ 27) Explain the following relational algebra operation

- | | |
|----------------------------------|---------------------------------|
| ① Select (σ) | ⑦ Intersection (\cap) |
| ② Project (π) | ⑧ Natural join (\bowtie) |
| ③ Union (\cup) | ⑨ Division operation (\div) |
| ④ Set Difference ($-$) | ⑩ outer join |
| ⑤ Cartesian Product (\times) | |
| ⑥ Rename | |
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✓ 28) Explain Unary relational operation with examples.

✓ Explain the different types of update operations on relational database. How basic operation deals with constraint violation.