



Salahaddin University-Hawler
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Software department



Sample of Questions

Database Design Course

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Level of Course: Undergraduate Degree

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Q1/ Specify the following SQL queries on the COMPANY relational database schema shown below, using the relational operators

COMPANY schema:

EMPLOYEE (Fname, Minit, Lname, Ssn, Bdate, Address, Sex, Salary, Super_ssn, Dno)

DEPARTMENT (Dname, Dnumber, Mgr_ssn, Mgr_start_date)

DEPT_LOCATION (Dnumber , Dlocation)

PROJECT (Pname, Pnumber , Plocation , Dnum)

WORK_ON (Essn, Pno, Hours)

DEPENDENT (Essn , Dependent_name , Sex , Bdate , Relationship)

1. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.
2. List the names of all employees who have a dependent with the same first name as themselves.
3. Find the names of all employees who are directly supervised by 'Franklin Wong'.
4. For each project, list the project name and the total hours per week (by all employees) spent on that project.
5. Retrieve the names of all employees who work on every project.
6. Retrieve the names of all employees who do not work on any project.
7. For each department, retrieve the department name and the average salary of all employees working in that department.
8. Retrieve the average salary of all female employees.
9. Find the names and addresses of all employees who work on at least one project located in Houston but whose department has no location in Houston.
10. List the last names of all department managers who have no dependents.

Q2/ Discuss the various types of inner join operations. Why is theta join required?

Q3/ What is the mean by a database schema? Give an example.

Q4/ What is the Aggregate FUNCTION operation in SQL?

Q5/Why does SQL allow duplicate tuples in a table or in a query result?

Q6/How does SQL allow implementation of the entity integrity and referential integrity constraints? What about referential triggered actions?

Q7/Describe the four clauses in the syntax of a simple SQL retrieval query. Show what type of constructs can be specified in each of the clauses. Which are required and which are optional?

Q8/What is the difference between a key and a superkey?

Q9/What is union compatibility? Why do the UNION, INTERSECTION, and DIFFERENCE operations require that the relations on which they are applied be union compatible?

Q10/Why do we designate one of the candidate keys of a relation to be the primary key?

Q11/ Explain the entity integrity and referential integrity constraints. Why each is considered important?

Q12/ Define foreign key. What is this concept used for?

Q15/ Consider the relation CLASS(Course#, Univ_Section#, Instructor_name, Semester, Building_code, Room#, Time_period, Weekdays, Credit_hours). This represents classes taught in a university, with unique Univ_section#s. Identify what you think should be various candidate keys, and write in your own words the conditions or assumptions under which each candidate key would be valid.

Q16/ List the data types that are allowed for SQL attributes.

Q17/ How does SQL allow implementation of the entity integrity and referential integrity constraints? What about referential triggered actions?

Q18/ Describe the four clauses in the syntax of a simple SQL retrieval query. Show what type of constructs can be specified in each of the clauses.

Q19/ Specify the following queries in SQL on the COMPANY relational database schema shown in Figure below.

EMPLOYEE

Fname	Minit	Lname	<u>Ssn</u>	Bdate	Address	Sex	Salary	Super_ssn	Dno
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DEPARTMENT

Dname	<u>Dnumber</u>	Mgr_ssn	Mgr_start_date
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DEPT LOCATION

<u>Dnumber</u>	<u>Dlocation</u>
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PROJECT

Pname	<u>Pnumber</u>	Plocation	Dnum
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WORK ON

<u>Essn</u>	<u>Pno</u>	Hours
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DEPENDENT

<u>Essn</u>	<u>Dependent_name</u>	Sex	Bdate	Relationship
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1. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.

2. List the names of all employees who have a dependent with the same first name as themselves.
3. Find the names of all employees who are directly supervised by 'Franklin Wong'.

Q20/Consider the EMPLOYEE table's constraint EMPSUPERFK as specified in COMPANY schema below is changed to read as follows:

```
CONSTRAINT EMPSUPERFK
FOREIGN KEY (Super_ssn) REFERENCES EMPLOYEE(Ssn)
ON DELETE CASCADE ON UPDATE CASCADE,
```

COMPANY schema:

EMPLOYEE (Fname, Minit, Lname, <u>Ssn</u> , Bdate, Address, Sex, Salary, Super_ssn, Dno) DEPARTMENT (Dname, <u>Dnumber</u> , Mgr_ssn, Mgr_start_date) DEPT_LOCATION (<u>Dnumber</u> , <u>Dlocation</u>) PROJECT (Pname, <u>Pnumber</u> , Plocation , Dnum) WORK_ON (<u>Essn</u> , <u>Pno</u> , Hours) DEPENDENT (<u>Essn</u> , <u>Dependent_name</u> , Sex , Bdate , Relationship)
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Answer the following questions:

1. What happens when the following command is run on the database state?
DELETE EMPLOYEE WHERE Lname = 'Borg'
2. Is it better to CASCADE or SET NULL in case of EMPSUPERFK constraint ON DELETE?

Q21/ Discuss how each of the following constructs is used in SQL, and discuss the various options for each construct. Specify what each construct is useful for.

- a. Nested queries.
- b. Joined tables and outer joins.
- c. Aggregate functions and grouping.
- d. Triggers.
- e. Assertions and how they differ from triggers.
- f. Views and their updatability.
- g. Schema change commands.

Q22/ Specify the following queries on the database in COMPANY schema in SQL.

1. For each department whose average employee salary is more than \$30,000. Retrieve the department name and the number of employees working for that department.
2. Suppose that we want the number of male employees in each department making more than \$30,000. Can we specify this query in SQL? Why or why not?

Q23/Specify the following queries in SQL on the database schema in Figure below.

1. Retrieve the names and major departments of all straight-A students (students who have a grade of A in all their courses).
2. Retrieve the names and major departments of all students who do not have a grade of A in any of their courses.

Schema Student
STUDENT (Name , Student_number , Class , Major)
COURSE (Course_name , Course_number , Credit_hours , Department)
SECTION (Section_identifier , Course_number , Semester Year , Instructor)
GRADE_REPORT(Student_number , Section_identifier , Grade)
PREREQUISITE (Course_number , Prerequisite_number)

Q24/ Explain the various types of inner join operations. Why is theta join required?

Q25/ What role does the concept of foreign key play when specifying the most common types of meaningful join operations?

Q27/ Consider the following MAILORDER relational schema describing the data for a mail order company.

PARTS(Pno, Pname, Qoh, Price, Olevel)
CUSTOMERS(Cno, Cname, Street, Zip, Phone)
EMPLOYEES(Eno, Ename, Zip, Hdate)
ZIP_CODES(Zip, City)
ORDERS(Ono, Cno, Eno, Received, Shipped)
ODETAILS(Ono, Pno, Qty)

Qoh stands for quantity on hand: the other attribute names are self-explanatory. Specify the following queries using the RA interpreter on the MAILORDER database schema.

1. Retrieve the names of parts that cost less than \$20.00.
2. Retrieve the names and cities of employees who have taken orders for parts costing more than \$50.00.
3. Retrieve the pairs of customer number values of customers who live in the same ZIP Code.
4. Retrieve the names of customers who have ordered parts from employees living in Wichita.
5. Retrieve the names of customers who have ordered parts costing less than \$20.00.
6. Retrieve the names of customers who have not placed an order.
7. Retrieve the names of customers who have placed exactly two orders.

Q28/ Consider a database that consists of the following relations.

SUPPLIER(Sno, Sname)
PART(Pno, Pname)
PROJECT(Jno, Jname)
SUPPLY(Sno, Pno, Jno)

The database records information about suppliers, parts, and projects and includes a ternary relationship between suppliers, parts, and projects. This relationship is a many-many-many relationship. Specify and execute the following queries using the RA interpreter.

1. Retrieve the part numbers that are supplied to exactly two projects.
2. Retrieve the names of suppliers who supply more than two parts to project 'J1'.

3. Retrieve the part numbers that are supplied by every supplier.
4. Retrieve the project names that are supplied by supplier 'S1' only.
5. Retrieve the names of suppliers who supply at least two different parts each to at least two different projects.

Q29/ What is meant by a recursive relationship type? Give some examples of recursive relationship types.

Q30/ Try to map the relational schema in figure below into an ER schema. State any assumptions you make.

Q31/ Consider SQL

1 . SELECT Fname, Lname, Address
FROM EMPLOYEE, DEPARTMENT
WHERE Dname='Research' **AND** Dnumber=Dno;

2. SELECT E.Fname, E.LName, E.Address
FROM EMPLOYEE E, DEPARTMENT D
WHERE D.DName='Research' **AND** D.Dnumber=E.Dno;

3 .SELECT E.Fname, E.Lname, S.Fname, S.Lname
FROM EMPLOYEE AS E, EMPLOYEE AS S
WHERE E.Super_ssn=S.Ssn;

4 .(SELECT DISTINCT Pnumber
FROM PROJECT, DEPARTMENT, EMPLOYEE
WHERE Dnum=Dnumber **AND** Mgr_ssn=Ssn
AND Lname='Smith')
UNION
(SELECT DISTINCT Pnumber
FROM PROJECT, WORKS_ON, EMPLOYEE
WHERE Pnumber=Pno **AND** Essn=Ssn
AND Lname='Smith');

Answer the following:

- a. Draw a query trees that can represent each of these queries.
- b. Draw the initial query tree for each of these queries, and then show how the query tree is optimized by the heuristic optimization algorithm.

Q32/What are the important factors that influence physical database design?