



Salahaddin University-Hawler
College of Engineering
Software department



Sample of Questions
Database Principles Course

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Level of Course: Undergraduate Degree

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Q1/What is union compatibility? Why do the UNION, INTERSECTION, and DIFFERENCE operations require that the relations on which they are applied be union compatible?

Q2/ What is the mean by a database schema? Give an example.

Q3/ student table: find (cardinality, degree, key(s), domains for each attribute), can have general constraints? (if yes, how?)

Note (SSN = Social Security No, GPA = Grade Point Average)

| Name | SSN | HomePhone | Address | OfficePhone | Age | GPA |
|-----------------|-------------|-----------|----------------------|-------------|-----|------|
| Dick Davidson | 422-11-2320 | null | 3452 Elgin Road | 749-1253 | 25 | 3.53 |
| Barbara Benson | 533-69-1238 | 839-8461 | 7384 Fontana Lane | null | 19 | 3.25 |
| Charles Cooper | 489-22-1100 | 376-9821 | 265 Lark Lane | 749-6492 | 28 | 3.93 |
| Katherine Ashly | 381-62-1245 | 375-4409 | 125 Kirby Road | null | 18 | 2.89 |
| Benjamin Bayer | 305-61-2435 | 373-1616 | 2918 Bluebonnet Lane | null | 19 | 3.21 |

Student Table

Q4/ What is the FUNCTION operation? What is it used for?

Q5/What is the difference between a key and a superkey?

Q6/Why are duplicate tuples not allowed in a relation?

Q7/Why do we designate one of the candidate keys of a relation to be the primary key?

Q8/ Explain the entity integrity and referential integrity constraints. Why each is considered important?

Q9/ Define foreign key. What is this concept used for?

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

Q11/ 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#. 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.

Q12/ Specify the following RA queries on the COMPANY relational database schema shown in Figure below.

| 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 |

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'.

Q13/ Specify the following queries on the database in COMPANY schema in RA.

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?

Q14/Specify the following queries in RA 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) |

Q15/ Briefly, write the properties of relations (tables).

Q16/ Write DB types and give an example for each.

Q17/ Briefly, explain functions of DBMS.

Q18/ Specify the following RA queries on the relational database schema shown below:

Hotel (hotelNo, hotelName, city)

Room (roomNo , hotelNo, type, price)

Booking (hotelNo , guestNo , dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

1. List all single rooms with a price below £20 per night.
2. List the price and type of all rooms at the Dedawan Hotel.
3. List the guest details (guestNo, guestName, and guestAddress) of all guests staying at the Dedawan Hotel.
4. List the details of all rooms at the Dedawan Hotel, including the name of the guest staying in the room, if the room is occupied.
5. For each hotel, find number of guests and total income from date (1/1/2022 to 10/1/2022). Give appropriate name for each attribute.

Q19/Answer the following:

| NIN | contractNo | hours | eName | hNo | hLoc |
|------|------------|-------|----------|-----|---------------|
| 1135 | C1024 | 16 | Smith J | H25 | East Kilbride |
| 1057 | C1024 | 24 | Hocine D | H25 | East Kilbride |
| 1068 | C1025 | 28 | White T | H4 | Glasgow |
| 1135 | C1025 | 15 | Smith J | H4 | Glasgow |

Figure 1 (Instant Cover agency)

Note (National Insurance Number (NIN))

1. The table shown in Figure 1 is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies.
2. Identify the functional dependencies represented by the attributes shown in the table of Figure 1.
State any assumptions you make about the data and the attributes shown in this table.
3. Describe and illustrate the process of normalizing the table shown in Figure 1 to 3NF.
Identify primary, alternate and foreign keys in your relations.

Q20/ Briefly, explain 5 functions of DBMS.

Q21/ What is DB? give a simple example specify keys and relations (**Note: no less than 2 tables**).

Q22/ Explain 3 level of Architecture in Figure 2.

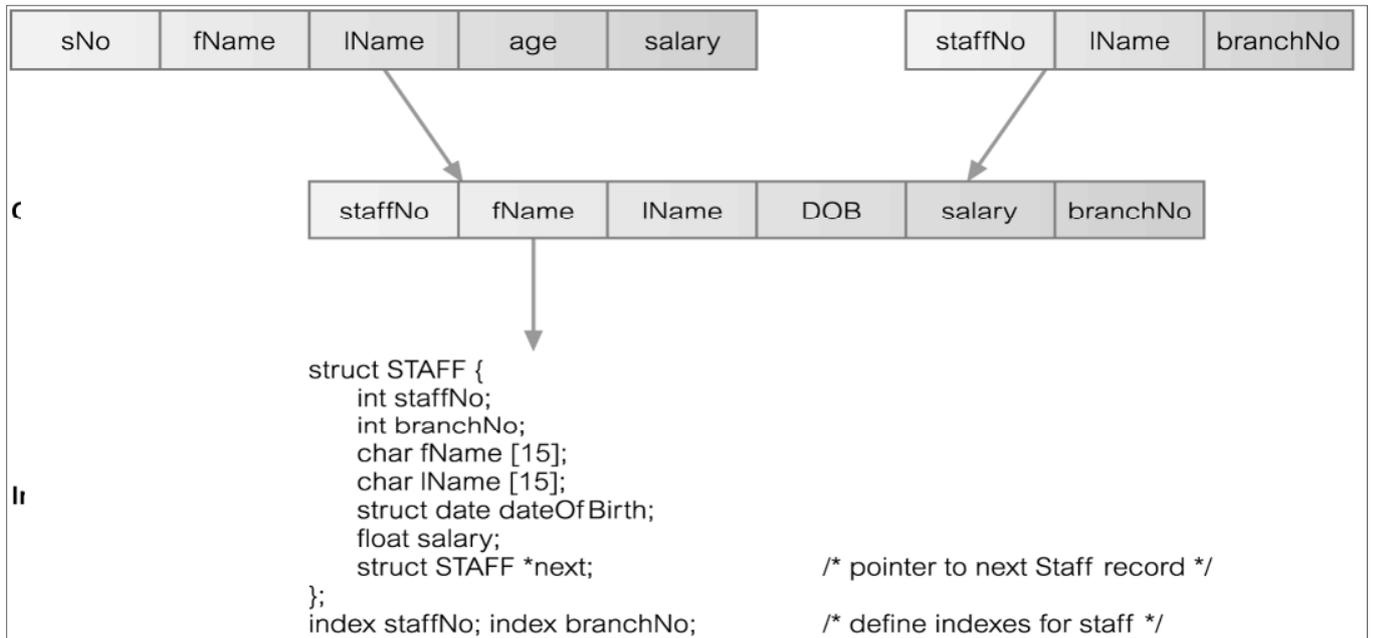


Figure 2 (level of Architecture)

Q23/ Lease table in Figure 3: find (cardinality, degree, key(s), domains for each attribute), can have general constraints? (if yes, how?)

| leaseNo | propertyNo | clientNo | rent | payment Method | deposit | paid | rentStart | rentFinish | duration |
|---------|------------|----------|------|----------------|---------|------|-----------|------------|----------|
| 10024 | PA14 | CR62 | 650 | Visa | 1300 | Y | 1-Jun-05 | 31-May-05 | 12 |
| 10075 | PL94 | CR76 | 400 | Cash | 800 | N | 1-Aug-05 | 31-Jan-05 | 6 |
| 10012 | PG21 | CR74 | 600 | Cheque | 1200 | Y | 1-Jul-05 | 30-Jun-05 | 12 |

Figure 3 (Lease Table)

Q24/ Discuss the architecture of a DBMS.

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

Q26/ Specify the following queries in RA on the COMPANY relational database schema shown below, using the relational operators

| |
|---|
| COMPANY schema: |
| EMPLOYEE (Fname, Minit, Lname, <u>Ssn</u> , Bdate, Address, Sex, Salary, Super_ssn, Dno) |
| DEPARTMENT (Dname, <u>Dnumber</u> , <u>Mgr_ssn</u> , 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) |

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.

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 selfexplanatory. 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.

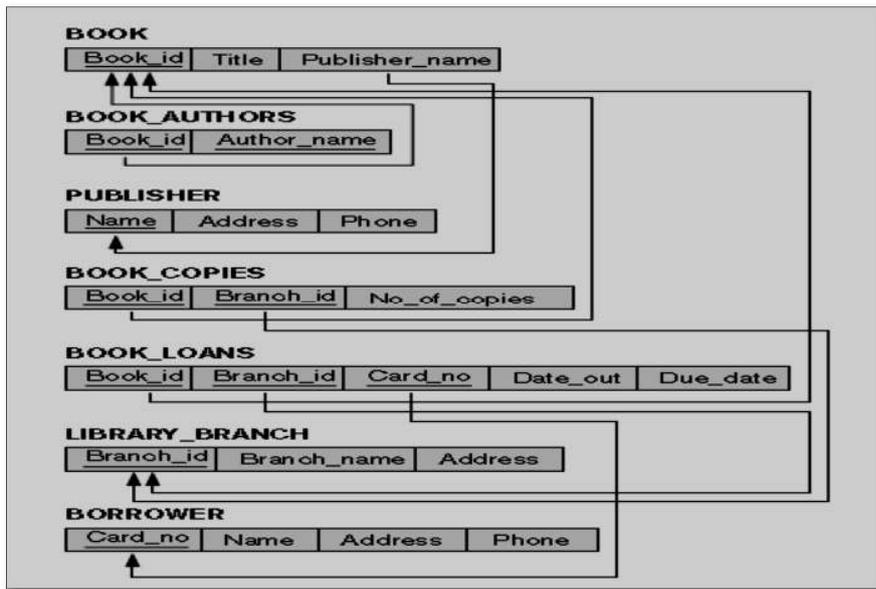
| |
|--|
| SUPPLIER(Sno, Sname) PART(Pno, Pname) PROJECT(Jno, Jname) SUPPLY(Sno, Pno, Jno) |
|--|

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 are the important factors that influence physical database design?

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



Q31/ What is the difference between primary and secondary storage?

Q32/ Identify the advantages and disadvantages of DBMS.

Q33/specify the different algorithms for implementing each of the following relational operators and the circumstances under which each algorithm can be used: SELECT, JOIN.

Q34 / What is DBMS?

Q35/what is first Normal form? give simple example.