

CITS 1402

Practice Exam 2024

This exam consists of two parts. The first part is about SQL queries and the second part consists of MCQs.

Part A: Read the case study and write SQL queries on the question paper in the space provided. You can do some rough work on the last two pages but that will not be graded.

Following is an ERD of a parking lot database.

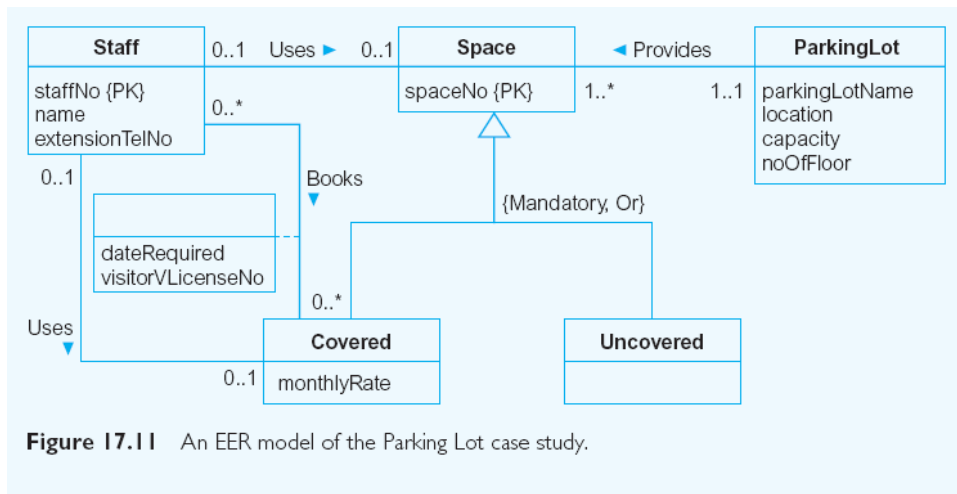


Figure 17.11 An EER model of the Parking Lot case study.

Relations

Staff(staffNo, fName, lName extensionTelNo)
Primary Key staffNo

ParkingLot(parkingLotName, location, capacity, noOfFloor)
Primary Key parkingLotName

Covered(spaceNo, staffNo, monthlyRate, parkingLotName)
Primary Key spaceNo
Foreign Key parkingLotName References ParkingLot(parkingLotName)
Foreign Key staffNo References Staff(staffNo)

Uncovered(spaceNo, staffNo, parkingLotName)
Primary Key spaceNo
Foreign Key parkingLotName References ParkingLot(parkingLotName)
Foreign Key staffNo References Staff(staffNo)

Books(staffNo, spaceNo, dateRequired, visitorVLicenseNo)
Primary Key staffNo, spaceNo
Foreign Key staffNo references Staff(staffNo)
Foreign Key spaceNo references Covered(spaceNo)

Q1. Write an SQL query to create a table named Staff with the following columns:

- staffNo (integer, primary key)
- fName (varchar, up to 50 characters)
- lName (varchar, up to 50 characters)
- extensionTelNo (varchar, up to 10 characters)

```
CREATE TABLE Staff (  
    staffNo INTEGER PRIMARY KEY NOT NULL,  
    fName VARCHAR(50),  
    lName VARCHAR(50),  
    extensionTelNo VARCHAR(10)  
);
```

Q2. Write an SQL query to insert a new row into the ParkingLot table with the following details:

- parkingLotName = 'Lot A'
- location = 'North Wing'
- capacity = 100
- noOfFloor = 2

```
INSERT INTO ParkingLot (parkingLotName, location, capacity, noOfFloor)  
VALUES ('Lot A', 'North Wing', 100, 2);
```

Q3. Write an SQL query to delete a row from the Covered table where the spaceNo is 101 and the staffNo is 2001.

```
DELETE FROM Covered  
WHERE spaceNo = 101 AND staffNo = 2001;
```

Q4. Write an SQL query to list all staff members from the Staff table, ordered by their last names (lName) in ascending order. If there are multiple staff members with the same last name, order those by their first names (fName) in ascending order.

```
SELECT staffNo, fName, lName, extensionTelNo  
  
FROM Staff  
  
ORDER BY lName ASC, fName ASC;
```

Q5. Write an SQL query to find the total capacity of all parking lots from the ParkingLot table. The result should be a single number representing the sum of the capacity column.

```
SELECT SUM(capacity) AS totalCapacity  
  
FROM ParkingLot;
```

Q6. Write an SQL query to select all staff numbers (staffNo) and first names (fName) from the Staff table, but rename the fName column to firstName in the result set.

```
SELECT staffNo, fName AS firstName  
  
FROM Staff;
```

Q7. Write an SQL query to list all staff members and the details of their assigned covered parking spaces from the Staff and Covered tables. The result should include the staffNo, fName, lName, spaceNo, and monthlyRate. If a staff member does not have an assigned covered parking space, their details should still be included in the result with NULL values for the parking space details.

```
SELECT Staff.staffNo, Staff.fName, Staff.lName, Covered.spaceNo,  
  
Covered.monthlyRate  
  
FROM Staff  
  
LEFT JOIN Covered ON Staff.staffNo = Covered.staffNo;
```

====

```
SELECT Staff.staffNo, Staff.fName, Staff.lName, Covered.spaceNo,  
Covered.monthlyRate
```

```
FROM Staff, Covered
```

```
WHERE Staff.staffNo = Covered.staffNo
```

```
UNION ALL
```

```
SELECT Staff.staffNo, Staff.fName, Staff.lName, NULL AS spaceNo, NULL AS  
monthlyRate
```

```
FROM Staff
```

```
WHERE Staff.staffNo NOT IN (SELECT staffNo FROM Covered);
```

Q8. Write an SQL query to list the first names (fName) and last names (lName) of staff members who have booked a parking space in the 'Covered' parking lot that has a capacity of more than 50. [Hint: Use subqueries]

```
SELECT fName, lName
```

```
FROM Staff
```

```
WHERE staffNo IN (
```

```
    SELECT staffNo
```

```
    FROM Books
```

```
    WHERE spaceNo IN (
```

```
        SELECT spaceNo
```

```
        FROM Covered
```

```
        WHERE parkingLotName IN (
```

```
            SELECT parkingLotName
```

```
            FROM ParkingLot
```

```
            WHERE capacity > 50
```

```
        )
```

```
    )
```

```
);
```

Q9. Write an SQL query to list the space numbers (spaceNo) of all parking spaces, whether they are covered or uncovered.

```
SELECT spaceNo
FROM Covered
UNION
SELECT spaceNo
FROM Uncovered;
```

Q10. Write an SQL query to list the staff numbers (staffNo) of staff members who have both covered and uncovered parking spaces [is this question correct?]

```
SELECT staffNo
FROM Covered
INTERSECT
SELECT staffNo
FROM Uncovered;
```

Q11. Write an SQL query to list the first names (fName), last names (lName), and extension telephone numbers (extensionTelNo) of staff members along with the parking lot names (parkingLotName) and space numbers (spaceNo) of their assigned covered parking spaces.

```
SELECT Staff.fName, Staff.lName, Staff.extensionTelNo, Covered.parkingLotName,
Covered.spaceNo
FROM Staff
JOIN Covered ON Staff.staffNo = Covered.staffNo;
```

==

SELECT

Staff.fName,

Staff.lName,

Staff.extensionTelNo,

Covered.parkingLotName,

Covered.spaceNo

FROM

Staff, Covered

WHERE

Staff.staffNo = Covered.staffNo;

Q12 Write an SQL query to create a view named StaffParkingDetails that includes the staff number (staffNo), first name (fName), last name (lName), extension telephone number (extensionTelNo), and the parking lot name (parkingLotName) for all staff members who have a covered parking space. [very similar to the last question ☹]

CREATE VIEW StaffParkingDetails AS

SELECT Staff.staffNo, Staff.fName, Staff.lName, Staff.extensionTelNo,
Covered.parkingLotName

FROM Staff

JOIN Covered ON Staff.staffNo = Covered.staffNo;

Part B: Multiple Choice Questions.

Please use a pencil to fill in one box for the right answer. Be careful while filling in. If there are pencil marks here and there, the automatic reader (a machine) will mark your answers wrong.

Q1. There are three main steps of Database design methodology. What is the main objective of Step 2 in the Database Design Methodology?

- A. To create a conceptual data model
- B. To translate the conceptual data model into a logical data model and validate it**
- C. To design physical storage structures
- D. To develop application programs

Q2. Which of the following steps is NOT part of building and validating a logical data model?

- A. Deriving relations for the logical data model
- B. Validating relations using normalization
- C. Designing user interfaces for data entry**
- D. Defining integrity constraints

Q3. In a one-to-many (1:*) binary relationship, which entity is designated as the parent entity?

- A. The entity on the 'many side' of the relationship
- B. The entity on the 'one side' of the relationship**
- C. The entity with the largest number of attributes
- D. The entity with the composite key

Q4. Which of the following is a guideline for representing superclass/subclass relationships in a logical data model?

- A. Always merge superclass and subclass entities into a single relation
- B. Always keep superclass and subclass entities as separate relations
- C. Choose the representation based on participation and disjointness constraints**
- D. Ignore the superclass/subclass relationship in the logical data model

Q5. Which of the following is a purpose of normalization in relational database design?

- A. To minimize the number of tables in the database
- B. To produce a set of suitable relations that support the data requirements of an enterprise**
- C. To maximize redundancy in the database
- D. To ensure that each table has only one column

Q6. What is the main characteristic of a relation in Second Normal Form (2NF)?

- A. It contains one or more repeating groups
- B. It is in 1NF and every non-primary-key attribute is fully functionally dependent on the primary key**
- C. It is in 1NF and contains a transitive dependency
- D. It is in 3NF and contains a partial dependency

Q7. Which of the following describes a transitive dependency?

- A. An attribute is dependent on only part of the primary key
- B. An attribute is dependent on the primary key through another non-primary key attribute**
- C. An attribute is dependent directly on the primary key
- D. An attribute is independent of the primary key

Consider the scenario for the next two questions:

Scenario

You are designing a database for a university to manage information about courses, instructors, and students. The initial unnormalized table (UNF) is shown below:

CourseID	CourseName	InstructorID	InstructorName	StudentID	StudentName
C001	Database	I001	Dr. Smith	S001	John Doe
C001	Database	I001	Dr. Smith	S002	Jane Doe
C002	Networking	I002	Dr. Brown	S001	John Doe
C002	Networking	I002	Dr. Brown	S003	Alice Smith

Q8. Which of the following best represents the table in First Normal Form (1NF)?

- A. Splitting the table into separate tables for courses, instructors, and students
- B. Removing duplicate instructor names from the table

C. Ensuring each cell contains only one value and adding a unique identifier for each row

D. Combining CourseID and InstructorID into a single column

Q9. Assuming the table is now in First Normal Form (1NF), how would you convert it to Second Normal Form (2NF)?

A. Ensure that all non-primary-key attributes are fully functionally dependent on the primary key

B. Remove transitive dependencies from the table

C. Split the table into separate tables for courses, instructors, and students, ensuring that each table has a unique primary key

D. Merge all rows that have the same CourseID into a single row

Q10 Which of the following relational algebra operations is used to retrieve rows that meet a specified condition from a single relation?

A. Projection (π)

B. Selection (σ)

C. Union (\cup)

D. Cartesian Product (\times)

Q11. What is the primary purpose of relational algebra in the context of relational databases?

A. To define how data is physically stored on disk

B. To perform complex mathematical calculations on data

C. To provide a formal language for querying and manipulating relational data

D. To design the user interface for database management systems

Q12. Given the following relations:

Staff (staffNo, fName, lName, position, salary, branchNo)

Branch (branchNo, street, city, postcode)

Which relational algebra expression retrieves the first name, last name, and city of all staff members who work in a branch located in 'London'?

- A. $\pi_{fName, lName, city}(\sigma_{city='London'}(Staff \times Branch))$
- B. $\pi_{fName, lName, city}(\sigma_{city='London'}(Staff) \bowtie Branch)$
- C. $\pi_{fName, lName, city}(\sigma_{city='London'}(Staff \bowtie_{Staff.branchNo=Branch.branchNo} Branch))$
- D. $\pi_{fName, lName, city}(\sigma_{city='London'}(Staff) \cup Branch)$

Correct Answer: C

This question involves a join operation and selection with specific attributes, testing a deeper understanding of relational algebra expressions.

Q13. In the context of specialization/generalization in the EER model, what does the disjoint constraint specify?

- A. Whether an entity in the superclass can belong to multiple subclasses**
- B. Whether every entity in the superclass must be a member of a subclass
- C. The total number of entities in the subclass
- D. The number of attributes inherited from the superclass

Q14. Which of the following statements is true regarding the representation of foreign keys in an Entity-Relationship Diagram (ERD) using UML notation?

- A. Foreign keys are explicitly shown as attributes in the entity boxes.
- B. Foreign keys are represented by dashed lines connecting entities.
- C. Foreign keys are implicitly represented by the relationships between entities and are not shown as attributes.**
- D. Foreign keys are not used in UML-based ERDs.

Q15 Which of the following best describes a subquery in SQL?

- A. A query that is executed last in a series of SQL statements
- B. A SELECT statement that is nested within another SELECT statement**
- C. A special type of JOIN operation
- D. A query that updates multiple rows in a database

Q16. Which of the following SQL set operations is used to find rows that are present in one result set but not in another?

- A. UNION
- B. INTERSECT
- C. EXCEPT**
- D. JOIN

Q17. What is the primary purpose of the GROUP BY clause in an SQL SELECT statement?

- A. To filter rows based on a specified condition
- B. To sort the result set in ascending or descending order
- C. To aggregate data across multiple rows and group the result set based on one or more columns**
- D. To join multiple tables together in a query

Q18. Which SQL statement correctly deletes a row from the table 'Employees' where the 'employeeID' is 1234?

- A. REMOVE FROM Employees WHERE employeeID = 1234;
- B. DELETE FROM Employees WHERE employeeID = 1234;**
- C. DROP FROM Employees WHERE employeeID = 1234;
- D. ERASE FROM Employees WHERE employeeID = 1234;