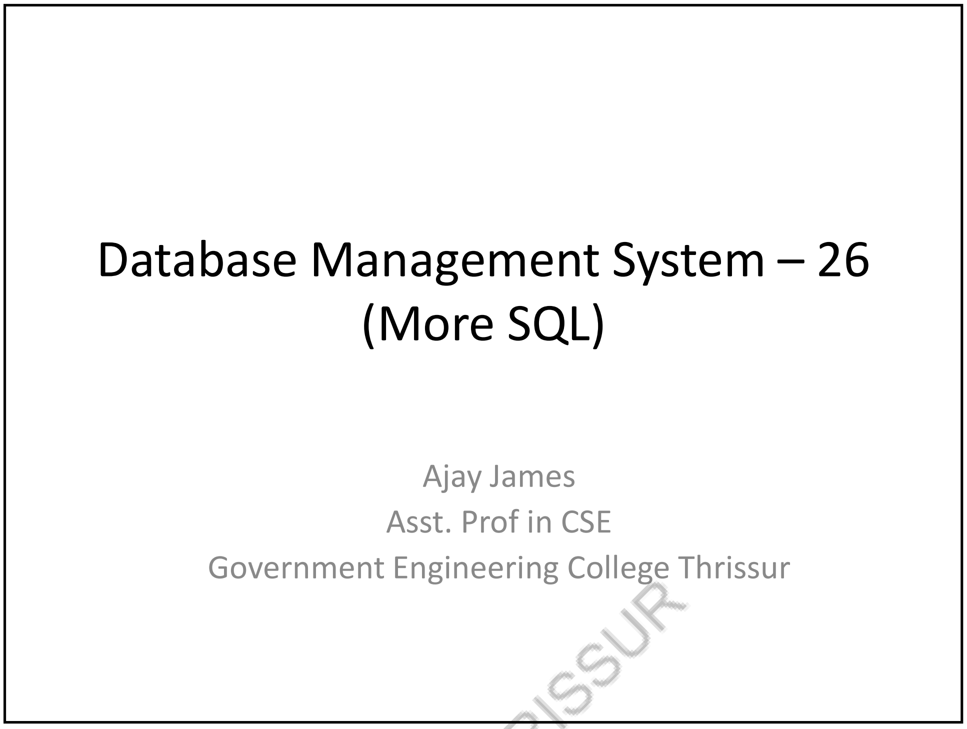

Database Management System – 26 (More SQL)

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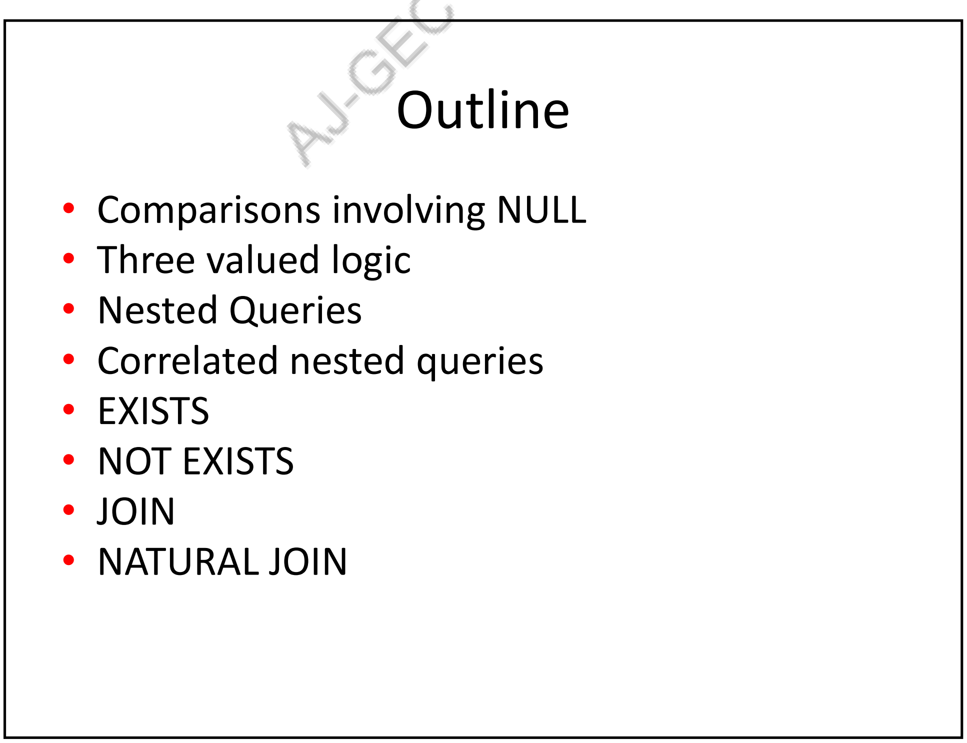


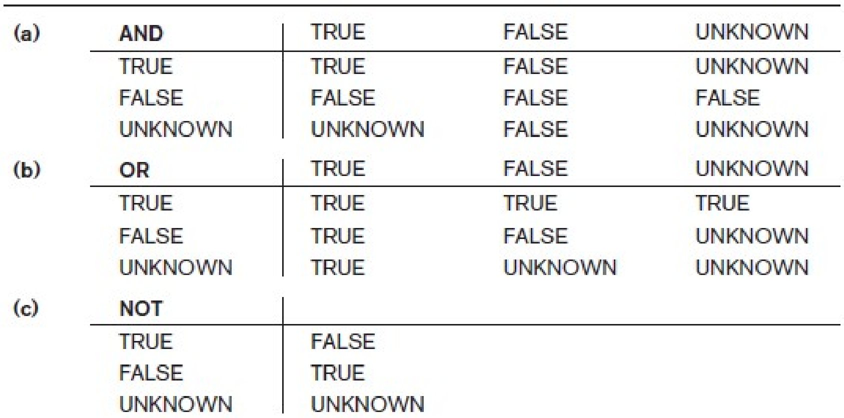
Outline

- Comparisons involving NULL
- Three valued logic
- Nested Queries
- Correlated nested queries
- EXISTS
- NOT EXISTS
- JOIN
- NATURAL JOIN

Comparisons Involving NULL

- **Unknown value**
  - A person’s date of birth is not known, so it is represented by NULL in the database
- **Unavailable or withheld value**
  - A person has a home phone but does not want it to be listed, so it is withheld and represented as NULL in the database
- **Not applicable attribute**
  - An attribute LastCollegeDegree would be NULL for a person who has no college degrees because it does not apply to that person

Three-Valued Logic



(a)

AND	TRUE	FALSE	UNKNOWN
TRUE	TRUE	FALSE	UNKNOWN
FALSE	FALSE	FALSE	FALSE
UNKNOWN	UNKNOWN	FALSE	UNKNOWN

(b)

OR	TRUE	FALSE	UNKNOWN
TRUE	TRUE	TRUE	TRUE
FALSE	TRUE	FALSE	UNKNOWN
UNKNOWN	TRUE	UNKNOWN	UNKNOWN

(c)

NOT	
TRUE	FALSE
FALSE	TRUE
UNKNOWN	UNKNOWN

Example

- *Retrieve the names of all employees who do not have supervisors*

```
SELECT Fname, Lname
FROM EMPLOYEE
WHERE Super_ssn IS NULL;
```

Nested Queries

- Complete select-from-where blocks within another SQL query
- **Outer query**
- Nested queries can also appear in the WHERE clause or the FROM clause or the SELECT clause or other SQL clauses as needed

Example

- Make a list of all project numbers for projects that involve an employee whose last name is ‘Smith’, either as a worker or as a manager of the department that controls the project

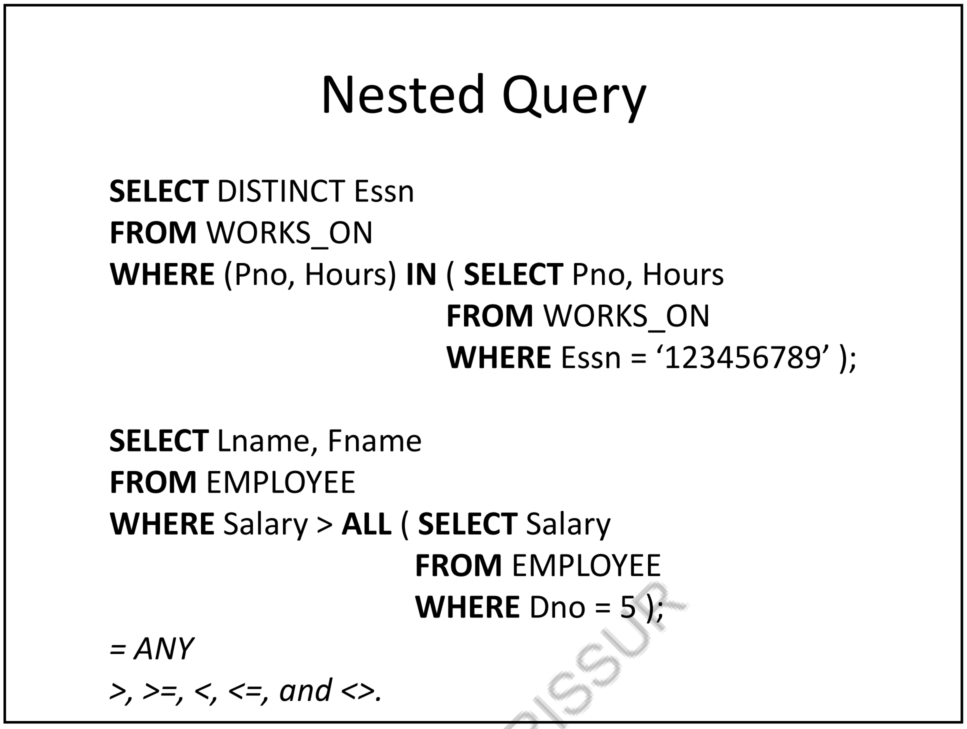
```
( SELECT DISTINCT Pnumber
FROM PROJECT, DEPARTMENT, EMPLOYEE
WHERE Dnum = Dnumber AND Mgr_ssn = Ssn
          AND Lname = ‘Smith’ )

UNION

( SELECT DISTINCT Pnumber
FROM PROJECT, WORKS_ON, EMPLOYEE
WHERE Pnumber = Pno AND Essn = Ssn
         AND Lname = ‘Smith’ );
```

Nested example

```
SELECT DISTINCT Pnumber
FROM PROJECT
WHERE Pnumber IN
                    ( SELECT Pnumber
                    FROM PROJECT, DEPARTMENT, EMPLOYEE
                    WHERE Dnum = Dnumber AND
                    Mgr_ssn = Ssn AND Lname = ‘Smith’ )
                    OR
         Pnumber IN
                   ( SELECT Pno
                   FROM WORKS_ON, EMPLOYEE
                   WHERE Essn = Ssn AND Lname = ‘Smith’ );
```



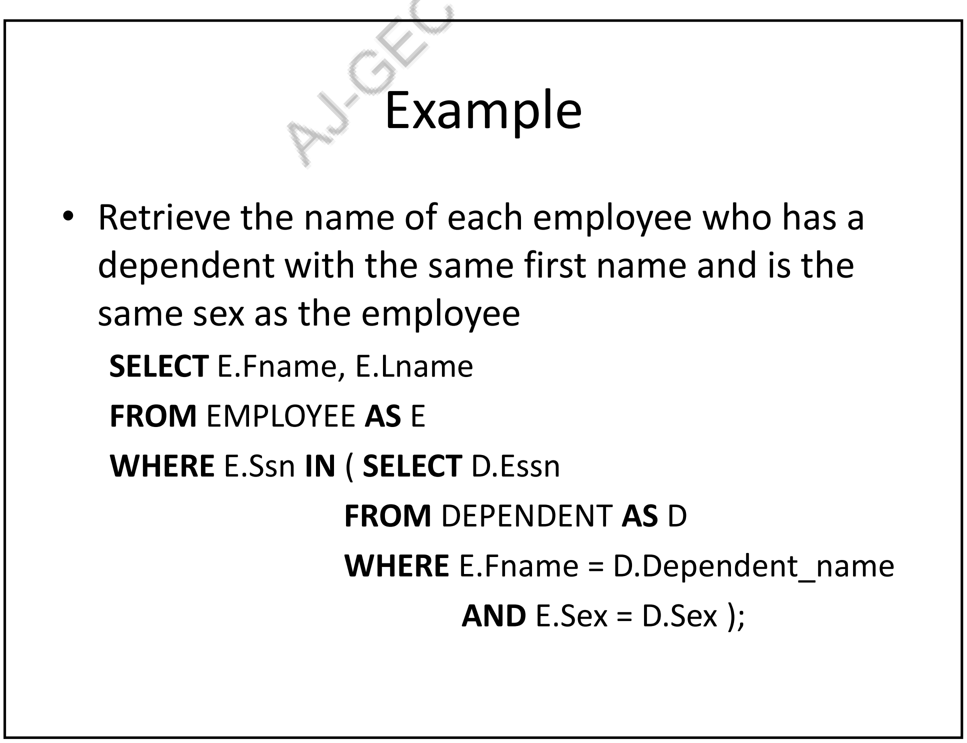
Nested Query

```
SELECT DISTINCT Essn
FROM WORKS_ON
WHERE (Pno, Hours) IN ( SELECT Pno, Hours
                        FROM WORKS_ON
                        WHERE Essn = ‘123456789’ );

SELECT Lname, Fname
FROM EMPLOYEE
WHERE Salary > ALL ( SELECT Salary
                     FROM EMPLOYEE
                     WHERE Dno = 5 );
```

= ANY

>, >=, <, <=, and <>.



Example

- Retrieve the name of each employee who has a dependent with the same first name and is the same sex as the employee

```
SELECT E.Fname, E.Lname
FROM EMPLOYEE AS E
WHERE E.Ssn IN ( SELECT D.Essn
                 FROM DEPENDENT AS D
                 WHERE E.Fname = D.Dependent_name
                       AND E.Sex = D.Sex );
```

Correlated Nested Queries

- Whenever a condition in the WHERE clause of a nested query references some attribute of a relation declared in the outer query, the two queries are said to be **correlated.**

```
SELECT E.Fname, E.Lname
FROM EMPLOYEE AS E, DEPENDENT AS D
WHERE E.Ssn = D.Essn AND E.Sex = D.Sex
          AND E.Fname = D.Dependent_name;
```

EXISTS

- Boolean function that return TRUE or FALSE
- Can be used in a WHERE clause condition
- Used to check whether the result of a nested query is empty (contains no tuples) or not
- Result of EXISTS is a Boolean value TRUE if the nested query result contains at least one tuple
- FALSE if the nested query result contains no tuples

EXISTS Example

- Retrieve the name of each employee who has a dependent with the same first name and is the same sex as the employee.

```
SELECT E.Fname, E.Lname
FROM EMPLOYEE AS E
WHERE EXISTS ( SELECT *
               FROM DEPENDENT AS D
                 WHERE E.Ssn = D.Essn AND E.Sex = D.Sex
                       AND E.Fname = D.Dependent_name);
```

NOT EXISTS Example

- Retrieve the names of employees who have no dependents.

```
SELECT Fname, Lname
FROM EMPLOYEE
WHERE NOT EXISTS ( SELECT *
                   FROM DEPENDENT
                   WHERE Ssn = Essn );
```

Joined Tables in SQL

- Permit users to specify a table resulting from a join operation in the FROM clause of a query
- Retrieve the name and address of all employees who work for the 'Research' department.

  SELECT Fname, Lname, Address

  FROM EMPLOYEE, DEPARTMENT

  WHERE Dname = 'Research' **AND** Dnumber = Dno;

JOIN Example

- Retrieve the name and address of all employees who work for the 'Research' department.

  SELECT Fname, Lname, Address

  FROM (EMPLOYEE **JOIN** DEPARTMENT **ON** Dno = Dnumber)

  WHERE Dname = 'Research';
- Attributes of such a table are all the attributes of the first table, EMPLOYEE, followed by all the attributes of the second table, DEPARTMENT

NATURAL JOIN

```
SELECT Fname, Lname, Address
FROM (EMPLOYEE NATURAL JOIN
          (DEPARTMENT AS DEPT (Dname, Dno,
                                    Mssn, Msdate)))
WHERE Dname = ‘Research’;
```

Reference

- Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education 6th edition and 7th edition

Thank you