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**MIT WORLD PEACE
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TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

CS312 Database Management Systems

School of Computer Engineering and
Technology

CS312 Database Management Systems

Course Objectives:

- 1) Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- 2) Learn Database Programming languages and apply in DBMS application
- 3) Understand transaction processing and concurrency control in DBMS
- 4) Learn database architectures, DBMS advancements and its usage in advance application

• Course Outcomes:

- 1) Design ER-models to represent simple database application scenarios and Improve the database design by normalization.
- 2) Design Database Relational Model and apply SQL , PLSQL concepts for database programming
- 3) Describe Transaction Processing and Concurrency Control techniques for databases
- 4) Identify appropriate database architecture for the real world database application

LABORATORY ASSIGNMENT NO: 03

Data Manipulation Language (DML)

DML commands are used to make modifications of the Database like,

- **Insertion** of new tuples into a given relation
- **Deletion** of tuples from a given relation.
- **Updation** of values in some tuples in a given relation

INSERT Query

- Add a new tuple to *course*

insert into *course*

values ('CS-437', 'Database Systems', 'Comp. Sci.', 4);

- or equivalently

insert into *course* (*course_id*, *title*, *dept_name*, *credits*)

values ('CS-437', 'Database Systems', 'Comp. Sci.', 4);

- Add a new tuple to *student* with *tot_creds* set to null

insert into *student*

values ('3003', 'Green', 'Finance', *null*);

DELETE Query

- Delete all instructors from the Finance department

delete from *instructor*
where *dept_name*= 'Finance';

- Delete all tuples in the *student* relation.

delete from *student*;

UPDATE Query

- Increase salaries of instructors whose salary is over \$100,000 by 3%, and all others by a 5%

- Write two **update** statements:

```
update instructor  
  set salary = salary * 0.03  
  where salary > 100000;
```

```
update instructor  
  set salary = salary * 0.05  
  where salary <= 100000;
```

- Can be done better using the **case** statement (next slide)

SELECT Query

- The SELECT statement is used to select data from a database tables.

Select -----

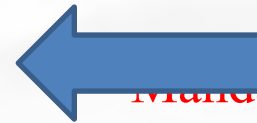
From

Where

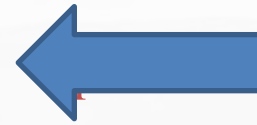
Group by

Having

Order by



Mandatory Clause



Clauses(Use as per need)

E.g. ***SELECT * FROM Student;***

- The result of an SQL query is a relation.

SELECT Query (Cont..)

- An attribute can be a literal with **from** clause

select 'A' from instructor

- Result is a table with one column and N rows (number of tuples in the *instructors* table), each row with value “A”.

Arithmetic Operations in SELECT Query

- The **select** clause can contain arithmetic expressions involving the operation, +, −, *, and /, and operating on constants or attributes of tuples.

- The Query:

```
select ID, name, salary/12
```

```
from instructor
```

would return a relation that is the same as the *instructor* relation, except that the value of the attribute *salary* is divided by 12.

- Can rename “*salary/12*” using the **as** clause:

SQL Functions



Single Row Functions : Operates on each row and out for each row



Date Functions, String Functions, Number Functions, Conversion Functions



Multirrow Function : Aggregate Function/Group Row : Operates on Group of row, provide o/p per group

String Function : Use in Select, Where, group by , having , order by Clause

Function	Meaning
Char_length(string)	Return number of characters in argument
Concat(expr1,expr2)	Return concatenated string
Instr(expr1,expr2)	Return the index of the first occurrence of substring
Lower(expr1)	Return the argument in lowercase
Left(expr1,count)	Return the leftmost number of characters from string
Lpad(expr1,length,expr2)	left-pads a string with another string, to a certain length
Ltrim()	Remove leading spaces
Substr(string,startpos,length)	extracts a substring from a string (starting at any position).
LOCATE(<i>substring</i> , <i>string</i> , <i>start</i>)	returns the position of the first occurrence of a substring in a string
STRCMP(<i>string1</i> , <i>string2</i>)	compares two strings. Returns 0,1,-1
Upper(string)	Convert the text to upper-case
Trim(string)	removes leading and trailing spaces from a string.

DATE Function : Use in Select, Where, group by having Clause, order by clause

Function	Meaning
ADDDATE(date, INTERVAL value addunit)	adds a time/date interval to a date and then returns the date
CURDATE() function	returns the current date. as "YYYY-MM-DD" (string)
DATEDIFF(date1, date2)	returns the number of days between two date values
DATE_SUB(date, INTERVAL value interval)	subtracts a time/date interval from a date and then returns the date
DAY(date)	returns the day of the month for a given date
DAYNAME(date)	returns the weekday name for a given date.
SYSDATE()	returns the current date and time.

The WHERE Clause

- The **where** clause specifies conditions that the result must satisfy
 - Corresponds to the selection predicate of the relational algebra.
- To find all instructors in Comp. Sci. dept

```
select name
from instructor
where dept_name = 'Comp. Sci.'
```
- Comparison results can be combined using the logical connectives **and**, **or**, and **not**
 - To find all instructors in Comp. Sci. dept with salary > 80000

```
select name
from instructor
where dept_name = 'Comp. Sci.' and salary > 80000
```

The FROM Clause

- The **from** clause lists the relations involved in the query
 - Corresponds to the Cartesian product operation of the relational algebra.
- Find the Cartesian product *instructor X teaches*
select *
from *instructor, teaches*
 - generates every possible instructor – teaches pair, with all attributes from both relations.
 - For common attributes (e.g., *ID*), the attributes in the resulting table are renamed using the relation name (e.g., *instructor.ID*)
- Cartesian product not very useful directly, but useful combined with where-clause condition (selection operation in relational algebra).

Renaming table in Select clause

- The SQL allows renaming relations and attributes using the **as** clause:

old-name as new-name

- Find the names of all instructors who have a higher salary than some instructor in 'Comp. Sci'.

```
select distinct T.name  
from instructor as T, instructor as S  
where T.salary > S.salary and S.dept_name = 'Comp. Sci.'
```

- Keyword **as** is optional and may be omitted

instructor as T \equiv *instructor T*

Ordering the Display of Tuples

- List in alphabetic order the names of all instructors

```
select distinct name  
from instructor  
order by name
```

- We may specify **desc** for descending order or **asc** for ascending order, for each attribute; ascending order is the default.

Example: **order by** *name* **desc**

- Can sort on multiple attributes

Example: **order by** *dept_name*, *name*

Where Clause Predicates

- SQL includes a **between AND** comparison operator
- Example: Find the names of all instructors with salary between \$90,000 and \$100,000 (that is, \geq \$90,000 and \leq \$100,000)

```
select name  
from instructor  
where salary between 90000 and 100000
```

Null Values

- It is possible for tuples to have a null value, denoted by *null*, for some of their attributes
- *null* signifies an unknown value or that a value does not exist.
- The result of any arithmetic expression involving *null* is *null*
 - Example: $5 + \text{null}$ returns null
- The predicate **is null** can be used to check for null values.
 - Example: Find all instructors whose salary is null.
select name
from instructor
where salary is null

Perform DML Statements

Create tables with all constraints and perform SQL- DML (Insert, Update, Delete), SQL Select- Logical IN, Negation , NULL, Comparison Operators. Where Clause, Between AND, Exists, ALL, LIKE command and solve queries.

Exercises -Batch A B C D E

Create Database

- Create a database called COMPANY consisting of 2 tables
 - EMP
 - DEPT

- **EMP Table Fields**

Column name	Data type	Description
EMPNO	Number	Employee number
ENAME	Varchar	Employee name
JOB	Char	Designation
MGR	Number	Manager's Emp. number
HIREDATE	Date	Date of joining
SAL	Number	Basic Salary
COMM	Number	Commission
DEPTNO	Number	Department Number

Create Database

- DEPT Table Fields

Column name	Data type	Description
DEPTNO	Number	Department number
DNAME	Varchar	Department name
LOC	Varchar	Location of department

Employee table sample records

EmpNo	Ename	Job	MGR	HireDate	Salary	Commission	Deptno
7369	Smith	Clerk	7902	17/12/80	800	300	20
7499	Allen	Salesman	7698	20/02/81	1600	300	30

Dept table sample records

DeptNo	Dname	Loc
10	Accounting	New York
20	Research	Dallas
30	Sales	Chicago
40	Operations	Boston

Queries- SET 1

- 1) List the number of employees and average salary for employees in department 20.
- 2) List name, salary and PF amount of all employees. (PF is calculated as 10% of basic salary)
- 3) List the employee details in the ascending order of their basic salary.
- 4) List the employee name and hire date in the descending order of the hire date.
- 5) List employee name, salary, PF, HRA, DA and gross; order the results in the ascending order of gross. HRA is 50% of the salary and DA is 30% of the salary.
- 6) List the department numbers and number of employees in each department.
- 7) Increment the Salary of salesman by 10% of basic salary.
- 8) List the total salary, maximum and minimum salary and average salary of the employees, for department 20.
- 9) List the employees whose names contains 3rd letter as 'I'.
- 10) List the maximum salary paid to a salesman.
- 11) Increase the salary of salesman by 10% of their current salary.

Queries- SET 2

1. List the employee names and his annual salary dept wise.
2. Find out least 5 earners of the company.
3. List the records from emp whose deptno is not in dept
4. List those employees whose sal is odd value.
5. List the employees whose sal contain 3 digits.
6. List the employees who joined in the month of 'DEC'
7. List the employees whose names contains 'A'
8. List the maximum, minimum and average salary in the company.
9. Write a query to return the day of the week for any date(or HIRE_DATE) entered in format 'DD-MM-YY'
10. Count the no of characters in employee name without considering spaces for each name.
11. List the employees who are drawing less than 1000. sort the output by salary.

Queries- Set 3

1. Write a query in SQL to display the unique designations for the employees.
2. Delete Employees who joined in Year 1980.
3. Increase the salary of Managers by 20% of their current salary.
4. List employees not belonging to department 30, 40, or 10.
5. List the different designations in the company.
6. List the names of employees who are not eligible for commission.
7. List employees whose names either start or end with “S”.
8. List employees whose names have letter “A” as second letter” in their names.
9. List the number of employees working with the company.
10. List the emps with hiredate in format June 4,1988.
11. List the salesmen who get the commission within a range of 200 and 500.

Queries- Set 4

1. List names of employees who are more than 2 years old in the company.
2. List the employee details in the ascending order of their basic salary.
3. Display the employees who have more salary as that of Smith
4. Increment the salary of Emp no. 7499 by 10% of his current salary.
5. List the employees whose salary is between 10000 and 25000.
6. List the names of employees who are not eligible for commission.
7. Increment the Salary of Clerk by 10% of basic salary.
8. List the total salary, maximum and minimum salary and average salary of the employees jobwise.
9. Delete the Employee whose name starts with P.
10. List the employees whose designation is “Clerk” and commission is > 500 .
11. List employees belonging to department 20, 30, 40.

Queries- Set 5

1. List the employee names and his annual salary Job wise.
2. Delete the Employee whose name starts with A & R
3. Increment the salary of Emp no. 7000 by 30% of his current salary.
4. List the total salary, maximum and minimum salary and average salary of the employees hire date wise.
5. List the employees whose names contains last letter as 'T'.
6. Display the employees who have less salary as that of Ankush
7. Display the employees who have salary between 10000
8. List employees belonging to department 30, 40, or 10.
9. List the employees whose designation is "Clerk" and sal is > 5000.
10. List the employees details descending wise whose designation is "Clerk" and commission is > 500.

Thank You!