# LECTURE 1

# OVERVIEW – QUERY PROCESSING (1/6)

- In SQL the user specifies what data is required rather than how it is retrieved

- ***Query processing*** refers to a range of activities involved in extracting data from database

# OVERVIEW – QUERY PROCESSING (2/6)

- **Steps in query processing**

1. Parsing and translation
2. Optimization
3. Evaluation

# OVERVIEW – QUERY PROCESSING (3/6)

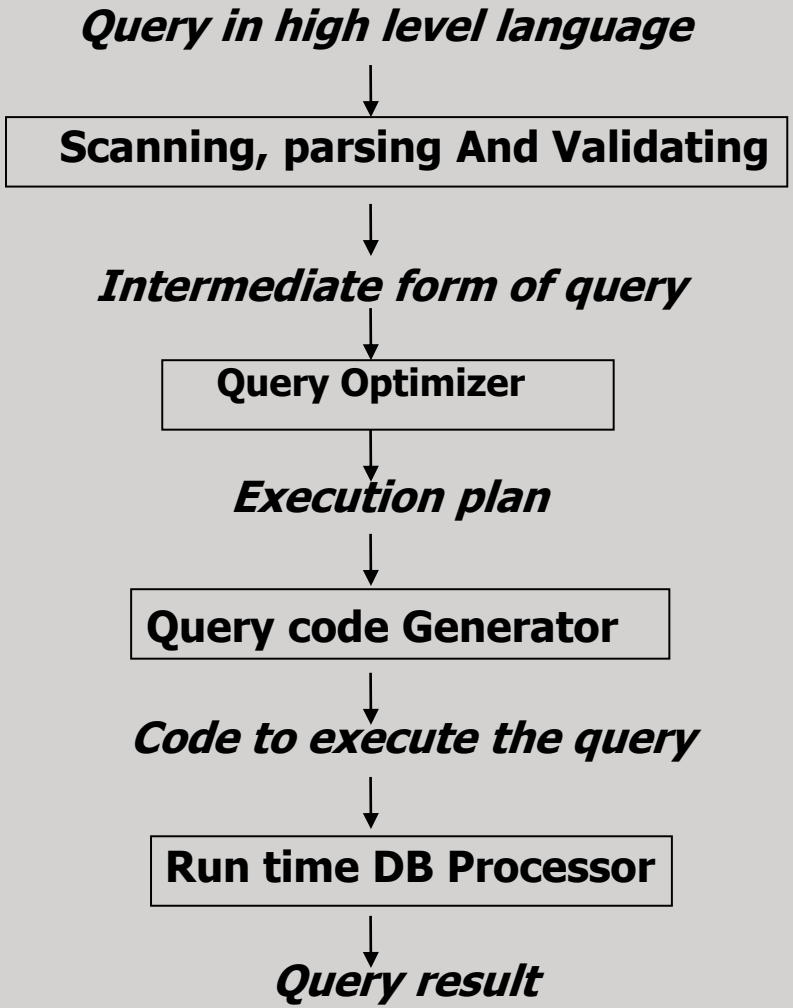
- Query is first scanned, parsed and validated
  - **Scanner** :- identify **tokens** (SQL keywords, attribute names, relation names)
  - **Parser** :- checks the query **syntax**
  - **Validation** :- checks all attribute and relation names are **valid** and **meaningful**
- Internal representation of query is created in the form of a ***query tree*** or a ***query graph***

# OVERVIEW – QUERY PROCESSING (4/6)

- DBMS devise execution strategy for retrieving result
- Process of choosing suitable strategy for processing a query is called ***Query optimization***
- Run time database processor :- runs the code (compiled or interpreted) to give result

# OVERVIEW – QUERY PROCESSING (4/6)

**Steps in processing high level query**



# OVERVIEW – QUERY PROCESSING (6/6)

- The **objective in query optimization** is to select an **efficient execution strategy.**
- Choose the one that minimizes resource usage
- Two main **techniques** for query optimization are:
  - **Heuristic rules** that reorder operations in a query
  - **Estimated cost** i.e. Comparing different strategies based on relative cost, and selecting one that minimizes resource usage

# TRANSLATION OF SQL QUERIES INTO RELATIONAL ALGEBRA (1/4)

- SQL is translated into equivalent relational algebra expression represented as a query tree data structure
- SQL queries are decomposed into **query blocks** that are then translated into the algebraic operators and then optimized
- Query block contain single SELECT-FROM-WHERE expression

# TRANSLATION OF SQL QUERIES INTO RELATIONAL ALGEBRA (2/4)

- Example 1:

```
SELECT LName, FName
FROM EMPLOYEE
WHERE Salary > 5000;
```

- Example 2:

```
SELECT LName, FName
FROM EMPLOYEE
WHERE Salary > (SELECT MAX (Salary)
                FROM EMPLOYEE
                WHERE DNo = 1);
```

# TRANSLATION OF SQL QUERIES INTO RELATIONAL ALGEBRA (3/4)

- Example 3:

```
SELECT EName
FROM EMP, ASG
WHERE EMP.Eno = ASG.Eno AND ASG.dur > 37;
```

- Example 4:

```
SELECT ENo, Dno
FROM EMP
GROUP BY Dno;
```

# TRANSLATION OF SQL QUERIES INTO RELATIONAL ALGEBRA (4/4)

- Example 5:

  SELECT SUM(Salary), AVG(Salary)

  FROM EMP;