



Shri Shankaracharya Institute of Professional Management &
Technology, Raipur

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Roll No.:

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Enrollment No.:

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Course: B.tech Semester: 4th

Branch: C.S.E.

Subject Name: DBMS

Subject Code:

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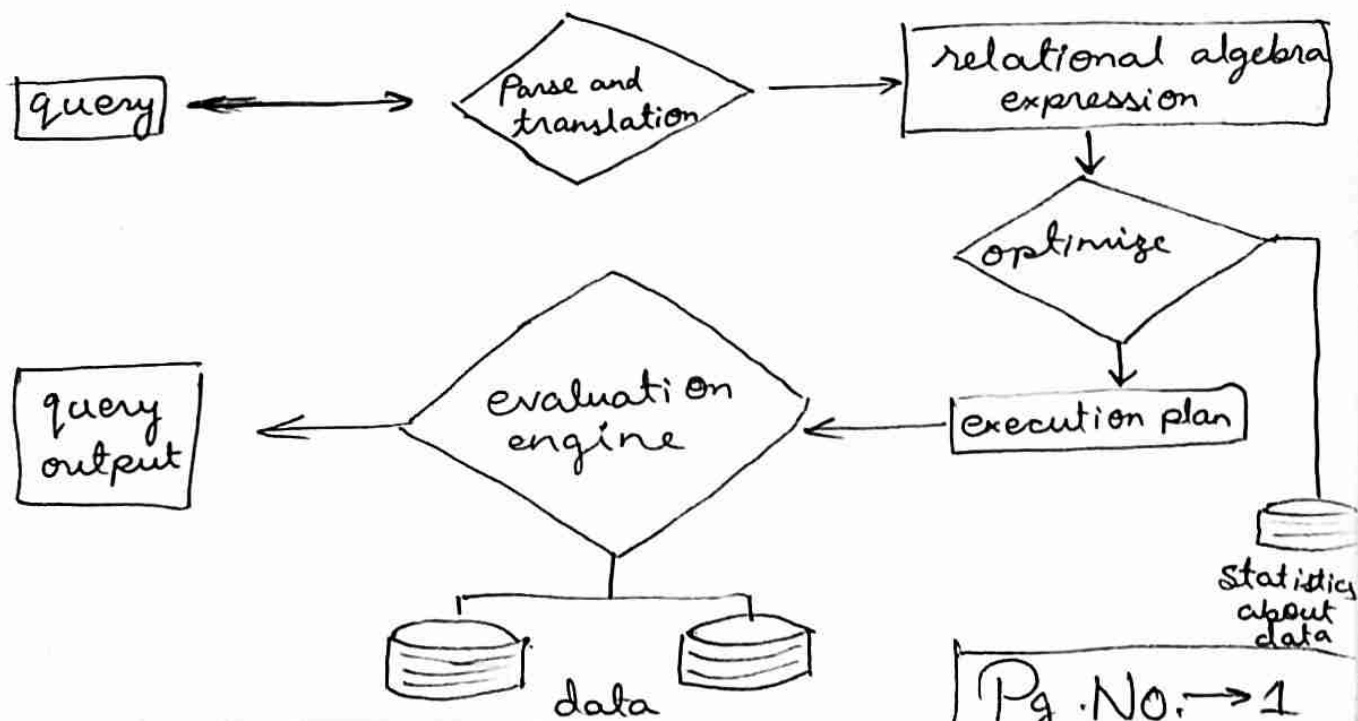
Q1

Ans(a)

Query Processing includes translation of high level queries into low level expressions that can be used at physical level of file system, query optimization and actual execution of query to get the actual result.

Basic steps in Query Processing:

- 1.) Parsing and translation.
- 2.) Optimization.
- 3.) Evaluation.



1.) Parsing and translation:

- Translate the query into its internal form. This is then translated into relational algebra.
- Parser checks syntax, verifies relation.

2.) Optimization:

- SQL is a very high level language:

⇒ The users specify what to search for not how the search is actually done.

⇒ The algorithms are chosen automatically by the DBMS.

- For a given SQL query there may be many possible execution plans.

- Amongst all equivalent plans choose the one with lowest cost.

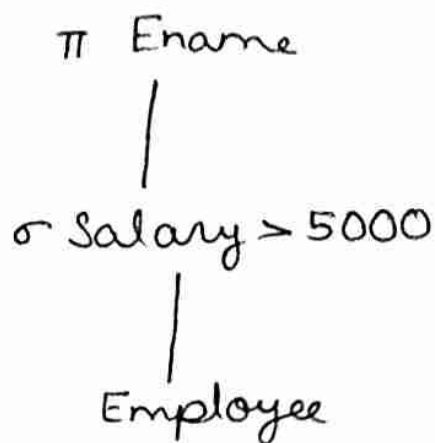
- Cost is estimated using statistical information from the database catalog.

3. The query

3.1) Evaluation:

→ The query evaluation engine takes a query evaluation plan, executes that plan and returns the answer to that query.

eg: SELECT Ename FROM Employee
WHERE Salary > 5000



Q1 > Ans(b)

B-tree is a data structure that provides sorted data and allows searches, sequential access, attachments, and removals in sorted order.

The B-tree is highly capable of storage systems that write large blocks of data.

B+ Tree:

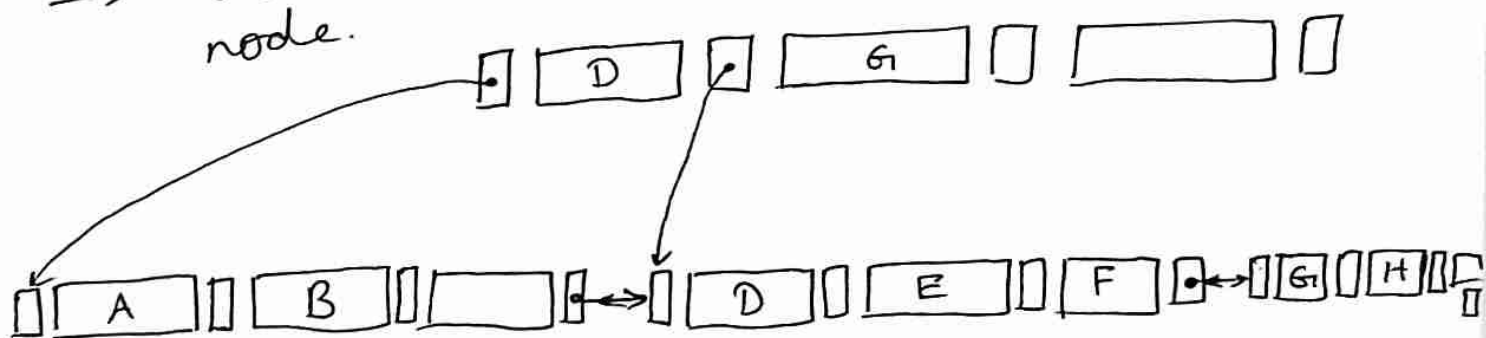
→ The B+ tree is a balanced binary search tree. It follows a multi-level index format.

→ In the B+ tree, leaf nodes denote actual data pointers. B+ tree ensures that all leaf nodes remain at the same height.

→ In the B+ tree, the leaf nodes are linked using a link list. Therefore, a B+ tree can support random access as well as sequential access.

→ In the B+ tree, every leaf node is at equal distance from the root node. The B+ tree is of the order n where n is fixed for every B+ tree.

→ It contains an internal node & leaf node.



~~Q 2 >~~ Q 2 >

Ans

Transaction: A transaction is a single logical unit of work formed by a set of operations. The operations which are between the beginning and the end of the transaction are counted as a single logical unit. The database is inconsistent during the transaction. It goes into a consistent state only when the transaction has occurred successfully. It is very important to have a successful transaction.

For example, if you are sending \$100 from your account to your friend's account, then the money deducted from your account should be reflected to your friend's account.

Acid Properties:

For maintaining the integrity of data in the database the certain properties are followed by all the transactions that take place in the database. These properties are popularly known as - ACID properties where A is for Atomicity, C for consistency, I for isolation and D for Durability.

Atomicity:

This property states that the transaction should either occur completely or doesn't occur at all. The transaction should not occur partially. Each transaction is treated as a unit and the execution is completely else the transaction is aborted. If any transaction is aborted all the changes made are reversed back. If the transaction occurs completely then only it is committed.

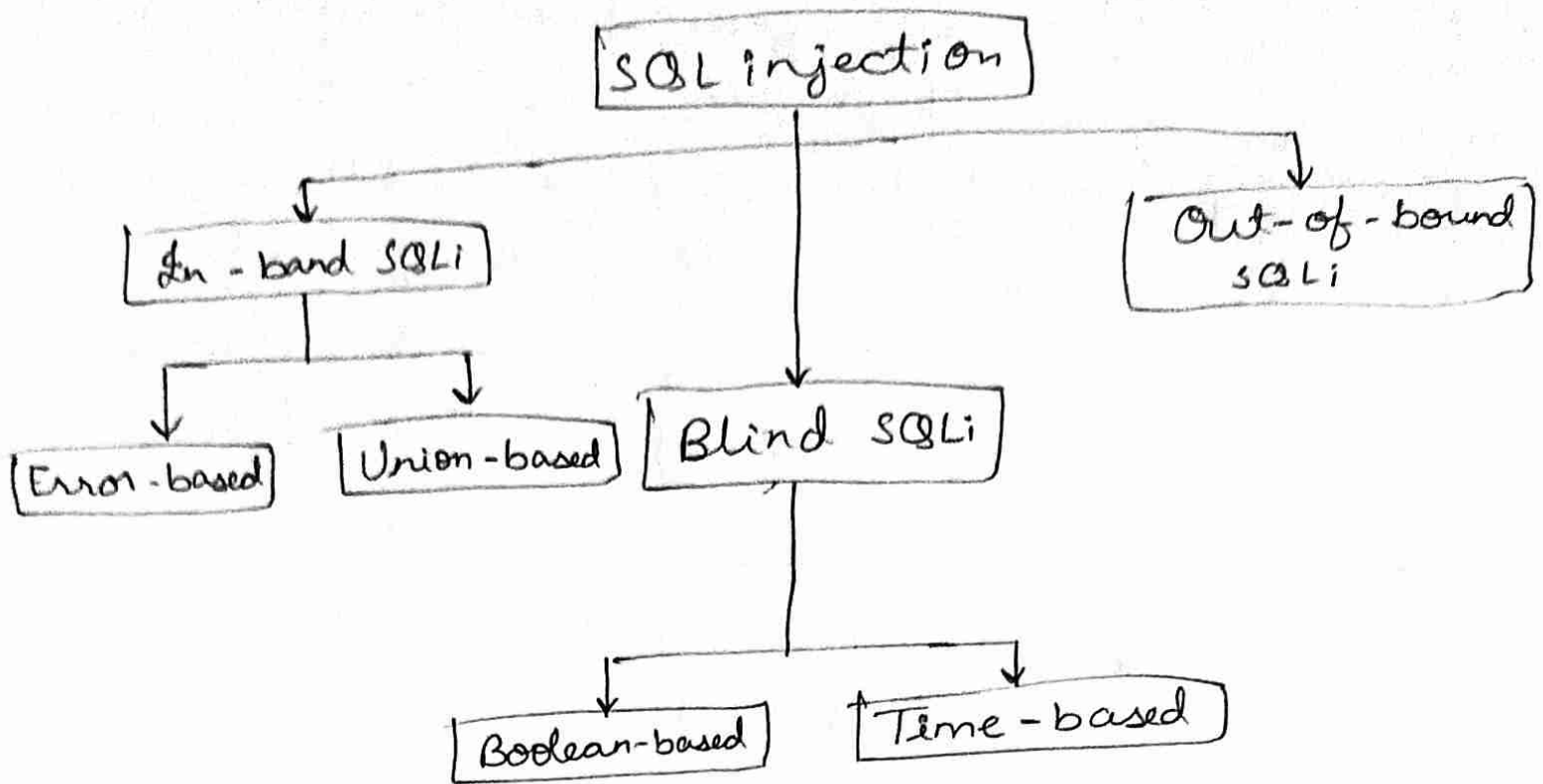
Consistency:

This property ensures that the integrity of the database is maintained before and after the transaction.

Isolation:

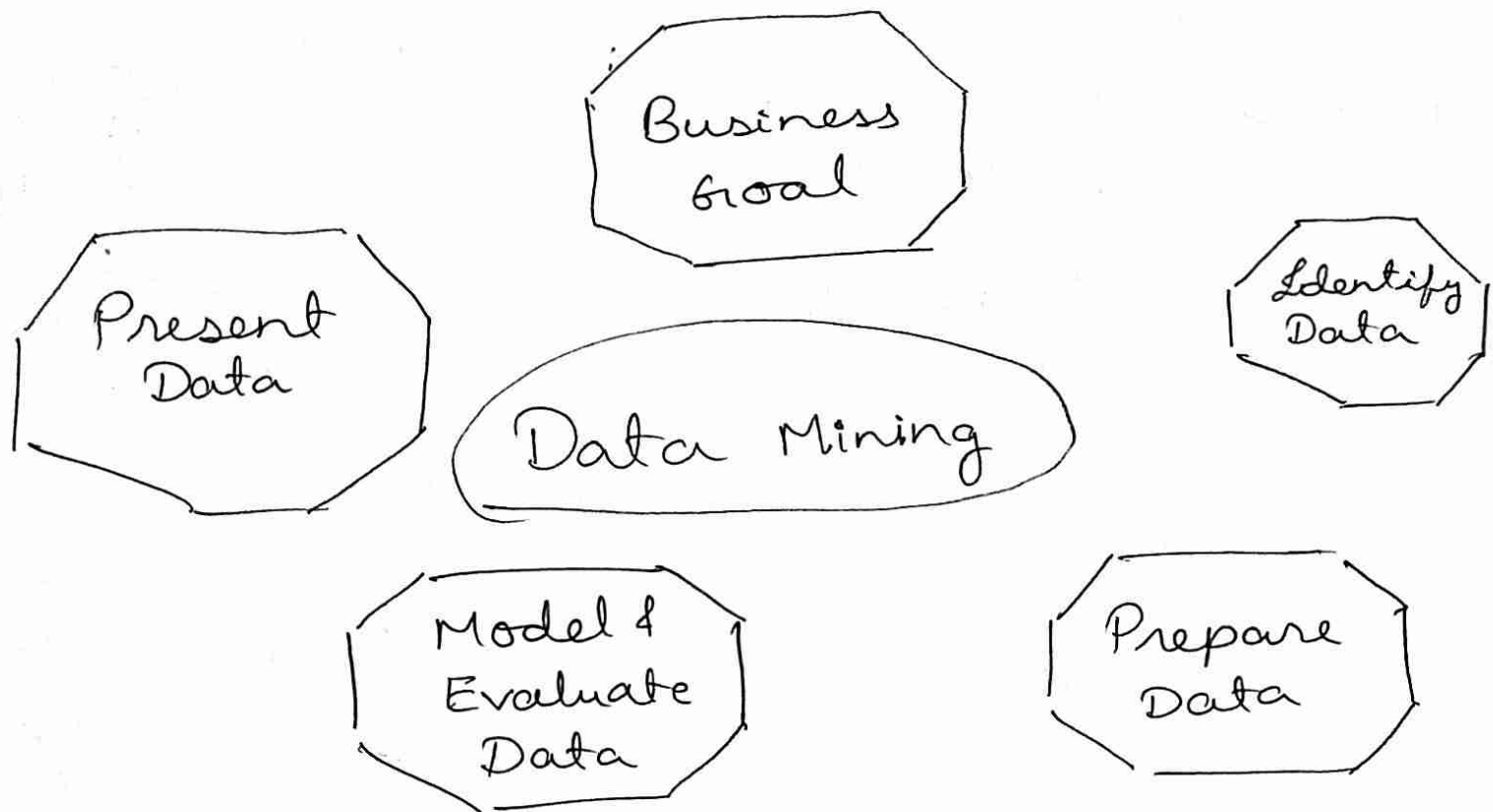
This property tells that each transaction is ~~ex~~ executed in the system such that it is the only transaction in the system. If more than one transaction is taking places in parallel, then the occurrence of one transaction will not affect the other transaction.

(i) SQL injection: It is a web security vulnerability that allows an attacker to interfere with the queries that an application makes to its database. It generally allows an attacker to view data that they are not normally able to retrieve. This might include data belonging to other data to access. In many cases, an attacker can modify, or delete this data, causing persistent changes to the application's content or behavior. In some situations, an attacker can escalate an SQL int. injection attack to compromise the underlying server or other back-end infrastructure or perform a denial-of-service attack.



(ii) Data mining is the process of sorting through large data sets to identify patterns and relationships that can help solve business problems through data analysis. Data mining techniques and tools enable enterprises to predict future trends and make more-informed business decisions. Data mining is a key part of data analytics overall and one of the core disciplines in data science, which uses advanced analytics techniques to find useful data sets.

At a more granular level, data mining is a step in the knowledge discovery in data science (KDD) process a data science methodology for gathering, processing and analysing data. Data minning and KDD are sometimes referred to interchangeably but they're more commonly seen as distinct things.



Q4)

Ans

Access Control: It is used to identify a subject (user/human) and to authorize the subject to access an object (data/resource) based on the required task.

These controls are used to protect resources from unauthorized access and are put into place to ensure that subjects can only access objects using secure and pre-approved methods.

Three main types of access control systems are:

- 1) ~~3-1~~. Discretionary Access Control (DAC).
- 2) ~~3-2~~. Role Based Access control (RBAC).
- 3) ~~3-3~~. Mandatory Access control (MAC).

1.) Discretionary Access control (DAC)

It is a type of security access control that grants or restricts object access via an access policy determined by an object's owner group and/or subjects.

DAC mechanisms controls are defined by user identification with supplied credentials during authentication, such as username and password. DAC's are discretionary because the subject (owner) can transfer authentication objects or information access to other users. In other words, the owner determines object access privileges.

2.) Mandatory Access Control (MAC):

It is a security strategy that restricts the ability individual resources owners have to grant or deny access to resource objects in a file system.

Mac MAC criteria are defined by the system administrator, strictly enforced by the operating system (OS) or security kernel, and are unable to be end users.

- 3.) RBAC (Role-based access control):
It restricts network access based on a person's role within an organization and has become one of the main methods for advanced access control. The roles in RBAC refer to the levels of access that employees have to the network. Employees are only allowed to access the information necessary to effectively perform their job duties. Access can be based on several factors, such as authority, responsibility, and job competency.

Q3

Ans(a)

T1	T2
read (A) $A := A - 50$ not write (A)	read (A) $temp := A * 0.1$ $A := A - temp$ write (A)
read (B) $B := B + 50$ write (B) commit	read (B) $B := B + temp$ write (B) commit

For the above ~~step~~ schedule to conflict serializable its precedence graph must not contain any cycle. To draw the precedence graph steps to be followed are:-

- ① For each transaction, participating in schedule, create a node labeled T_i .
- ② For each case where T_j executes $\text{read}(x)$ after T_i executes $\text{write}(x)$ draw edge from T_i to T_j .
- ③ For each case when T_j executes $\text{write}(x)$ after T_i executes $\text{read}(x)$ draw edge from T_i to T_j .
- ④ For each case when T_j executes $\text{write}(x)$ after T_i executes $\text{write}(x)$, create an edge ~~for~~ from T_i to T_j .
- ⑤ If no cycles in graph then the schedule is conflict serializable.

→ For given schedule,
~~The~~ Transaction involves is 2. so
 precedence graph will be,



→ T_2 executes $\text{read}(A)$ and $\text{read}(B)$ after T_1 executes $\text{write}(A)$ and $\text{write}(B)$.

→ T_2 executes $\text{write}(A)$ and $\text{write}(B)$ after T_1 executes $\text{read}(A)$ & $\text{read}(B)$.

- T_2 executes write(A) and write(B) after T_1 executes write(A) and write(B)
- As the precedence does not contains any cycle. Hence, the given schedule is conflict serializable.

Ans(b)

Two-phase locking:- In databases and transaction processing, two-phase locking is a concurrency control method that guarantees serializability. It is also the name of the resulting set of database transaction schedules. The protocol utilizes locks, applied by a transaction to data, which may block other transactions from accessing the same data, which may block other transactions from accessing the ~~some~~ same data during the transaction's life.

☞

Timestamp - based Protocols :- The most commonly used occupancy protocol is the timestamp based protocol. This protocol uses either system time or logical counter as a timestamp.

Lock-based protocols manage the order between the conflicting pairs among transactions at the time of execution, whereas timestamp-based protocols start working as soon as a transaction is created.

Every transaction has a timestamp associated with it, and the ordering is determined by the age of the transaction. A transaction created at 0002 clock time would be older than all other transactions that come after it. For example, any transactions 'y' entering the system at 0004 is two seconds younger and the priority would be given to the older one.

