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3. COMP 418
4. Assignment 4

## Part 1. Concepts and principles

### **Question 1**

**What are the main components of a database workload description?**

- The main components of a workload description are:

1) A list of queries (with their frequency, as a ratio of all queries)

2) A list of updates and their frequencies

3) Performance goals for each type of query and updates

### **Question 2**

**Discuss the main ideas and merits of the two access control mechanisms: discretionary access control and mandatory access control.**

- Discretionary access control is based on the idea of having access rights and privileges and having the mechanisms for providing them to different users in a system. With these privileges, users are allowed to access and modify data objects within the DBMS. This done via the Grant & Revoke commands.

Pros – Good for allowing just enough freedom of access to users for need to know/need to access data. Provides security by making sure you’re allowed to access and modify and object before allowing you to do so.

Cons – While secure in some right, it is still possible for users without access rights to get them from someone who does, simply by tricking them.

Mandatory access control is based on the idea of having system wide policies which can’t be changed by a singular user. Database objects are assigned security classes and users are assigned clearance classes. To have access to an object the user must have high enough clearance.

Pros – More secure than Discretionary access control

Cons- Susceptible to trojan horse attacks

### **Question 3**

### **What are the advantages of a distributed DBMS over a centralized DBMS?**

### - The advantages of a distributed DBMS over a centralized DBMS are as follows:

### 1) Distributed DBMSs have greater availability and reliability

### 2) Distributed DBMSs have faster response times

### 3) Distributed DBMSs are easier to scale up

### 4) Distributed DBMSs have a lower cost when it comes to communications

### 5) Distributed DBMSs are more robust

### **Question 4**

Explain fragmentation and replication, and explain their differences in data distribution and updating.

- Fragmentation : Fragmentation is the breaking down of a relation into smaller relations and storing them at different sites. It can be done either horizontally or vertically. In horizontal fragmentation we do the breaking down based on rows and in vertical we do it by columns.

Replication : Replication is the process of ensuring that we store several copies of the same relation or relation fragments at multiple sites.

In terms of data distribution and updating the main differences are in terms of data availability and query execution speed, in which the replication approaches are superior.

## Part 2. Design and tuning considerations

### **Question 1**

a)

Query 1 : Unclustered hash index on <specialty>

Query 2: Clustered B+ tree index on <age, dept\_did>

Query 3 : Unclustered hash index on <nbr\_programs>

Query 4: Clustered B+ tree index on <budget>

Query 5 : Unclustered B+ tree index on <chair\_sin>

b.

Step 1- Considering the number of candidate index configurations

Step 2 – Calculate the number of optimizer calls necessary for evaluating the cost of a configuration

Candidates – set of all combinations of indexable attributes from size 1 to size K.

### **Question 2**

a.

i)

CREATE VIEW EmployeeNames (ename)

AS SELECT ename

FROM Employee;

ii)

CREATE VIEW DeptInfo (dept, avgsalary)

AS SELECT dept, AVG(salary)

FROM Employee;

b.

Select privileges on a view created from DeptInfo is the only way to show only the HR and CS departments. (see statement for it below)

CREATE VIEW SeeHRCS

AS SELECT dept, avgsalary

FROM DeptInfo where dept = HR OR dept=CS;

GRANT SELECT ON SeeHRCS to ‘user’;

c.

GRANT SELECT, INSERT, UPDATE ON Employee to Joe WITH GRANT OPTION

GRANT SELECT,INSERT, UPDATE ON EmployeeNames to Joe WITH GRANT OPTION

No, Joe can’t read the DeptInfo view.

d.

No, there is no way to do this in SQL. She would either have to get Joe to revoke his rights or revoke Joe’s rights to revoke Mike’s and then give Joe back his rights to accomplish this.