**Higher National Diploma in Information Technology**

**Data Systems**

**Year 2 Semester 2**

**Tutorial – Query Optimisation**

1. Write the steps of Query Execution?
2. What is Query Optimisation?
3. In DBMS, what is the unit used to measure the time taken to execute query. Explain the choice of unit.
4. What is an access path?
5. Explain the term ‘most selective access path’
6. Consider the following relational schema and answer the questions.

Employee( eno: integer, ename: varchar(20), phone:varchar(20), dno: integer)

Department(dno: integer, dname: varchar(15), budget: float)

Assume there are 100 tuples in a page in Employee table and there are 200 such pages. There are 100 tuples in a page in Department and there are 40 such pages. Buffer size is 22.

Query 1:

Select eno, ename

From employee where dno =3

Assume 12% of employees are working in department 3.

1. Calculate the cost of executing query without using any indexes. Draw the extended query plan.
2. Calculate the cost of executing query using clustered Hash index on Employee table <dno> Cost to accesss Hash index is 1.2 I/Os. Draw the extended query plan.
3. Calculate the cost of executing query using unclustered Hash index on Employee table <dno> Cost to accesss Hash index is 1.2 I/Os. Draw the extended query plan.
4. Calculate the cost of executing query using clustered B+ Tree index on Employee table <dno> Cost to access B+ index is 2 I/Os. Draw the extended query plan.

Query 2:

Select eno, ename, dname

From employee e, department d where e.dno=d.dno

1. Calculate the cost of executing query using Simple Nested Loops Join algorithm. Draw the extended query plan.
2. Calculate the cost of executing query using Page Oriented Nested Loops Join algorithm. Draw the extended query plan. What is the minimum number of buffer pages required to execute this query.
3. Calculate the cost of executing query using Block Nested Loops Join algorithm. Draw the extended query plan.
4. If Index nested loops join algorithm is to be used, what are the indexes required?
5. Calculate the cost of executing query using Index Nested Loops Join algorithm. Draw the Best extended query plan.

Query 3:

Select eno, ename, dname

From employee e, department d

1. where e.dno=d.dno and d.dno=3
2. Calculate the cost of executing query using Simple Nested Loops Join algorithm. Draw the extended query plan.
3. Assume 12% of employees are working in department 3. There is a clustered Hash index on Employee<dno>. Draw the query plan using this index and calculate the cost. Join algorithm is Simple Nested Loops Join.
4. Calculate the cost of executing query using Page Oriented Nested Loops Join algorithm. Draw the extended query plan. What is the minimum number of buffer pages required to execute this query.
5. Calculate the cost of executing query using Block Nested Loops Join algorithm. Draw the extended query plan.
6. Assume 12% of employees are working in department 3. If Index nested loops join algorithm is to be used, what are the indexes required?
7. Calculate the cost of executing query using Index Nested Loops Join algorithm. Draw the Best extended query plan.

Query 4:

Select eno, ename, dname

From employee e, department d

where e.dno=d.dno and dno<3 and budget>100000

Assume 12% of employees are working in a department where dno < 3.

5% of departments have a budget over 100000.

1. Calculate the cost of executing query using Simple Nested Loops Join algorithm. Draw the Best extended query plan. Identify the indexes required for the optimal plan.
2. Calculate the cost of executing query using Page Oriented Nested Loops Join algorithm. Draw the best extended query plan. Identify the indexes required for the optimal plan.
3. Calculate the cost of executing query using Block Nested Loops Join algorithm. Draw the best extended query plan. Identify the indexes required for the optimal plan.
4. If Index nested loops join algorithm is to be used, what are the indexes required?
5. Calculate the cost of executing query using Index Nested Loops Join algorithm. Draw the Best extended query plan. Identify the indexes required for the optimal plan.