***DATABASE PROJECT***

***Schema1:***

**A close up of a map

Description automatically generated**

***Query#1***

select \*

from (select \*

from student

where

department = 'CS1') as CS1\_student

natural full outer join

(select \*

from takes t inner join section s

on t.section\_id = s.section\_id

where semester = 1

and

year = 2019) as sem1\_student;

***Scenario#1:***

A screenshot of a cell phone

Description automatically generated ***Without index***

**A screenshot of a social media post

Description automatically generated**

**Scenario#2:**

***With Hash Index***

***A screenshot of a cell phone

Description automatically generated***

***A screenshot of a cell phone

Description automatically generated***

**Scenario#3:**

***With Btree Index***

***A screenshot of a cell phone

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***A screenshot of a social media post

Description automatically generated***

**Scenario#4:**

***With Bitmap Index***

**Scenario#5:**

***Using Mixed Indices***

Since I was using a single column index on ***Student*** so adding any mixed index would increase the execution time and planning time so it would never be the optimal/best choice for the planner and the engine , here is an example.

A screenshot of a cell phone

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A screenshot of a social media post

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***Schema2:***

***A screenshot of a cell phone

Description automatically generated***

***Query#2***

select distinct pnumber

from project

where pnumber in

(select pnumber

from project, department d, employee e

where e.dno=d.dnumber

and

d.mgr\_snn=ssn

and

e.lname='employee1' )

or

pnumber in

(select pno

from works\_on, employee

where essn=ssn and lname='employee1' );

***Scenario#1:***

***Without index***

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***Scenario#2:***

***With Hash Index***

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A screenshot of a social media post

Description automatically generated

**Scenario#3:**

***With Btree Index***

A screenshot of a cell phone

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A screenshot of a social media post

Description automatically generated

**Scenario#4:**

***With Bitmap Index***

***Query#3:***

select lname, fname

from employee

where salary > all (

select salary

from employee

where dno=5 );

***Scenario#1:***

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**Scenario#2:**

***With Hash Index***

A screenshot of a social media post

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**Scenario#3:**

A screenshot of a cell phone

Description automatically generated ***With Btree Index***

A screenshot of a cell phone

Description automatically generated

**Scenario#4:**

***With Bitmap Index***

**Query#4:**

select e.fname, e.lname

from employee as e

where e.ssn in (

select essn

from dependent as d

where e.fname != d.dependent\_name

and

e.sex!=d.sex );

**Scenario#1:**

***Without Index***

**A screenshot of a social media post

Description automatically generated**

**Scenario#2:**

***With Hash Index***