

## Worksheet 1.2

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**Semester: I**

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### 1. Aim/Overview of the practical:

#### Experiment-1:

To implement and understand horizontal fragmentation of relations in a distributed database for efficient query processing and data distribution.

### 2. Question:

#### Horizontal Fragmentation and Relational Algebra Optimization in a Distributed Database Environment

- a) Given a relation employee in the following figure:

EMP

ENO	ENAME	TITLE
E1	J. Doe	Elect. Eng
E2	M. Smith	Syst. Anal.
E3	A. Lee	Mech. Eng.
E4	J. Miller	Programmer
E5	B. Casey	Syst. Anal.
E6	L. Chu	Elect. Eng.
E7	R. Davis	Mech. Eng.
E8	J. Jones	Syst. Anal.

- b)
- c) Let  $p_1: \text{TITLE} < \text{"Programmer"}$  and  $p_2: \text{Title} > \text{"Programmer"}$  be two simple predicates, assume that character strings have an order among them, based on the alphabetical order.
- d) Perform a horizontal fragmentation of relation EMP with respect to  $\{p_1, p_2\}$ .
- e) Explain why the resulting fragmentation (EMP1, EMP2) does not fulfill the correctness rules of fragmentation.
- f) Modify the predicates  $p_1$  and  $p_2$  so that they partition EMP obeying the correctness rules of fragmentation. To do this, modify the predicates, compose all minterm predicates and deduce the corresponding implications, and then perform a horizontal fragmentation of EMP based on these minterm predicates. Finally, show that the result has completeness, reconstruction and disjointness properties.

### 3. CODING:

- **Creation of Table:**

```
CREATE TABLE EMPLOYEE (  
    ENO VARCHAR(5) PRIMARY KEY,  
    ENAME VARCHAR(50),  
    TITLE VARCHAR(50),  
);
```

- **Insertion Of Records:**

```
INSERT INTO EMPLOYEE VALUES  
    ('E1', 'J. Doe', 'Elect.Eng');  
    ('E2', 'M. Smith', 'System Anal.');
```

```
    ('E3', 'A. Lee', 'Mech Eng.');
```

```
    ('E4', 'J. Miller', 'Programmer');
```

```
    ('E5', 'B. Casey', 'System Anal.');
```

```
    ('E6', 'L. Chu', 'Elect.Eng.');
```

```
    ('E7', 'R. Davis', 'Mech Eng.');
```

```
    ('E8', 'J. Jones', 'System Anal.');
```

- **Fragmentation in Table:**

```
CREATE TABLE EMP1 AS SELECT * FROM EMPLOYEE WHERE 1=0;  
CREATE TABLE EMP2 AS SELECT * FROM EMPLOYEE WHERE 1=0;
```

- **Insertion into these fragmented tables:**

Fragmentation 1:

```
INSERT INTO EMP1
```

```
SELECT * FROM EMPLOYEE
```

```
WHERE TITLE<'Programmer';
```

Fragmentation 2:

```
INSERT INTO EMP2
```

```
SELECT * FROM EMPLOYEE
```

```
WHERE TITLE>'Programmer';
```

- **Correctness:**

The resulting fragmentation do not fulfill the correctness rules of fragmentation as the TITLE= 'Programmer' is missing from both the tables.

To fix this we need to create one more table EMP3 which contains the title programmer.

**Fragmentation 3:**

```
CREATE TABLE EMP3 AS SELECT * FROM EMPLOYEE WHERE 1=0;
```

```
INSERT INTO EMP3
```

```
SELECT * FROM EMPLOYEE
```




```
WHERE TITLE='Programmer';
```

#### 4. OUTPUT:




##### a. Employee Table:

	<b>eno</b> [PK] character varying (5) 	<b>ename</b> character varying (50) 	<b>title</b> character varying (50) 
1	E1	J.Doe	Elect.Eng
2	E2	M.Smith	System Anal.
3	E3	A.Lee	Mech Eng.
4	E4	J.Miller	Programmer
5	E5	B.Casey	System Anal.
6	E6	L.Chu	Elect. Eng.
7	E7	R.Davis	Mech Eng.
8	E8	J.Jones	System Anal.

##### b. Emp1 Table:

	<b>eno</b> character varying (5) 	<b>ename</b> character varying (50) 	<b>title</b> character varying (50) 
1	E1	J.Doe	Elect.Eng
2	E3	A.Lee	Mech Eng.
3	E6	L.Chu	Elect. Eng.
4	E7	R.Davis	Mech Eng.

##### c. Emp2 Table:

	<b>eno</b> character varying (5) 	<b>ename</b> character varying (50) 	<b>title</b> character varying (50) 
1	E2	M.Smith	System Anal.
2	E5	B.Casey	System Anal.
3	E8	J.Jones	System Anal.

d. Emp3 Table:

	<b>eno</b> character varying (5) 🔒	<b>ename</b> character varying (50) 🔒	<b>title</b> character varying (50) 🔒
1	E4	J.Miller	Programmer

## 5. Learning Outcome:

- Creating a table.
- Insertion operation.
- Horizontal Fragmentation.
- Correctness rules of fragmentation.