VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Big Data Analytics (23CS6PCBDA)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019

March-2025 to June-2025

B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "**Big Data Analytics (23CS6PCBDA)**" carried out by **Sujnyan Kini(1BM22CS340),** who is bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2025. The Lab report has been approved as it satisfies the academic requirements in respect of a **Big Data Analytics - (23CS6PCBDA)** work prescribed for the said degree.

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Assistant Professor
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Professor and Head
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Index Sheet

7	For a given Text file, Create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words.	**41 - 49**
8	Write a Scala program to print numbers from 1 to 100 using for loop.	**50- 54**
9	Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark.	**55 - 58**
10	Write a simple streaming program in Spark to receive text data streams on a particular port, perform basic text cleaning (like white space removal, stop words removal, lemmatization, etc.), and print the cleaned text on the screen. (Open Ended Question).	**59 - 60**

Github-link: https://github.com/sujkini/BDA_lab

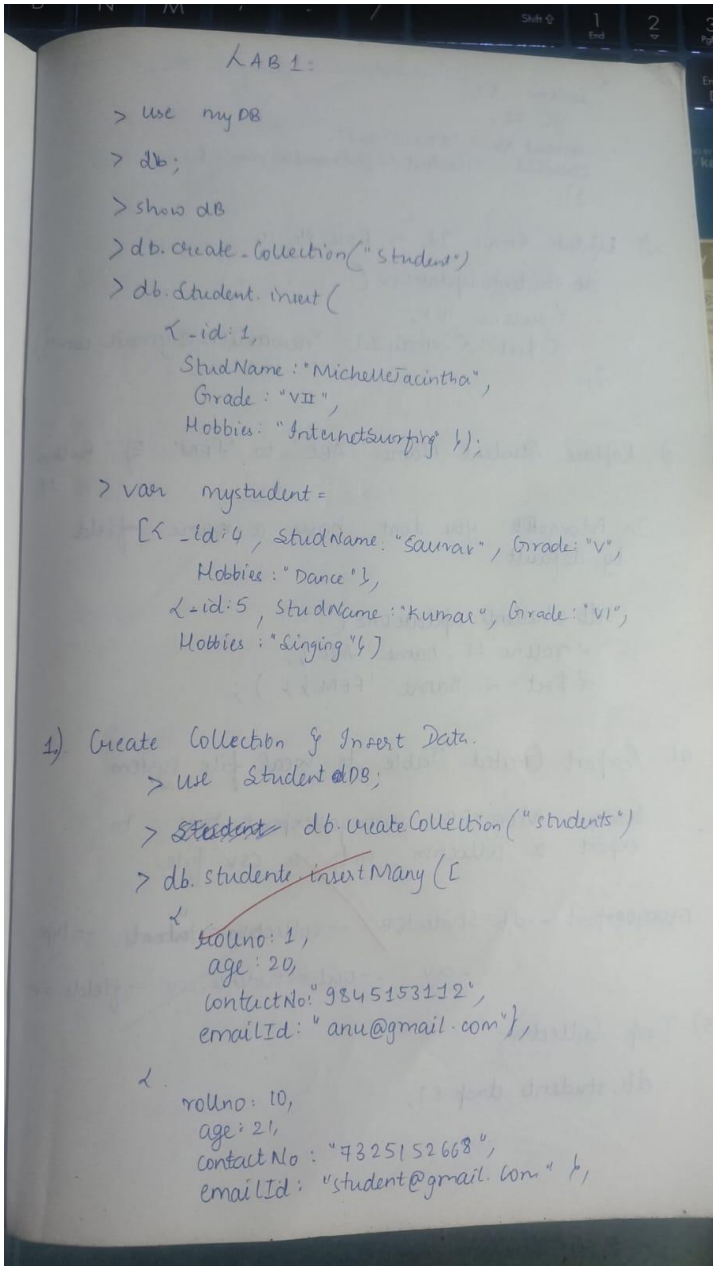
Course Outcome

CO1	Apply the concept of NoSQL, Hadoop or Spark for a given task
CO2	Analyze big data analytics mechanisms that can be applied to obtain solution for a given problem.
CO3	Design and implement solutions using data analytics mechanisms for a given problem.

Experiment-1

Q) MongoDB- CRUD Operations Demonstration (Practice and Self Study)

Screenshot:



{
rollno: 11,
age: 22,
contact No : "12345321",
emailId: "student11@example.com" }
]);

2) Update Email Id to Roll No 10:

db.students.updateOne(
{ rollno: 10 },
{ $set : { emailId: "newmail11@gmail.com" } }
);

3) Replace Student Name 'ABC' to 'FEM' of Rollno 11

In MongoDB you dont have a name field by default

db.students.updateOne(
{ rollno: 11, name: 'ABC' },
{ $set: { name: 'FEM' } });

4) Export Created Table to local file system

Using MongoDB's mongoexport tool to export a collection into a csv file.

mongoexport --db=StudentDB --collection=students --type=csv --out=students.csv --fields=r

5) Drop Collection.

db.students.drop();

LAB 2 MongodB Exercises:

① Customers

i) Create a collection with attributes: custid, acc_bal, acc_type & insert atleast 5 values into the table

```
> db.createCollection("Customer");
{ok:1}
> db.customer.insertMany([
{cust_id:1, acc_bal: 1500, acc_type: 'z'},
{cust_id:2, acc_bal: 900, acc_type: 'x'},
{cust_id:3, acc_bal: 2000, acc_type: 'z'},
{cust_id:4, acc_bal: 1100, acctype: '4'},
{cust_id:5, acc_bal: 1800, acc_type: 'z'},
])
```

ii) write a query to display those records whose total balance is gt 1200 of acc type 'z' for each cust_id

```
>db.Customers.find({acc_bal:{$gt:1200},
    acc_type:"z"})
```

iii) Determine min & max acc balance for each customer

```
>db.customer_aggregate([
{$group:{_id:"$cust_id", min_Balance:
    {$min:"$acc_bal"}, max_Balance:
    {$max:"$acc_bal"}
}])
```

(2) E-commerce platform.

> db.createCollection("products")
> db.createCollection("users")
> db.createCollection("orders")
> db.Products.insertMany([
{id:1, name: "Laptop", category: "Electronics", price: "800", quantity: 10},
{_id:2, name: "Phone", category: "Electronics", price: 500, quantity: 15},
{_id:3, name: "Headphone", cat: "Accessories", price: 50, quantity: 25}])

> db.users.insertMany([
{_id: "123abc", name: "Alice", cart: [{prod_id: 1, quant: 1}, {prod_id: 3, quant: 1}],
{_id: "789ghi", name: "Bob", cart: [{prod_id: 2, quant: 1}, {prod_id: 4, quant 1}]})

• Retrieve all products:
> db.product.find()

• Retrieve Products in specific Category
> db.Products.find({category: "Electronics"})

• Retrieve products with quant gt 0.
> db.Products.find({quantity: {$gt: 0}})

• Retrieve orders placed by user
> db.orders.aggregate([{$match: {user_id: "123abc"}},
{$group: {_id: "$user_id", total_spent: {$sum: "$total_price"}}}])

• Retrieve total price of orders placed.

>db.Products.aggregate([{$group: {_id: "$category", total_products: {$sum: 1}}}])

Additional queries:

1) Calculate total price of products in each category

>db.Products.aggregate([{$group: {_id: "$category", total_price: {$sum: "$price"}}}])

2) Find ~~average~~ price of ~~products~~ product. lentham 10

>db.Products.find({quantity: {$gt: 10}})

3) Find avg price

>db.Products.aggregate([{$group: {_id: null, avg_price: {$avg: "$price"}}}])

4) Sort products by price in desc.

>db.Products.find().sort({price: -1})

5) Cal. total price of orders placed by each user

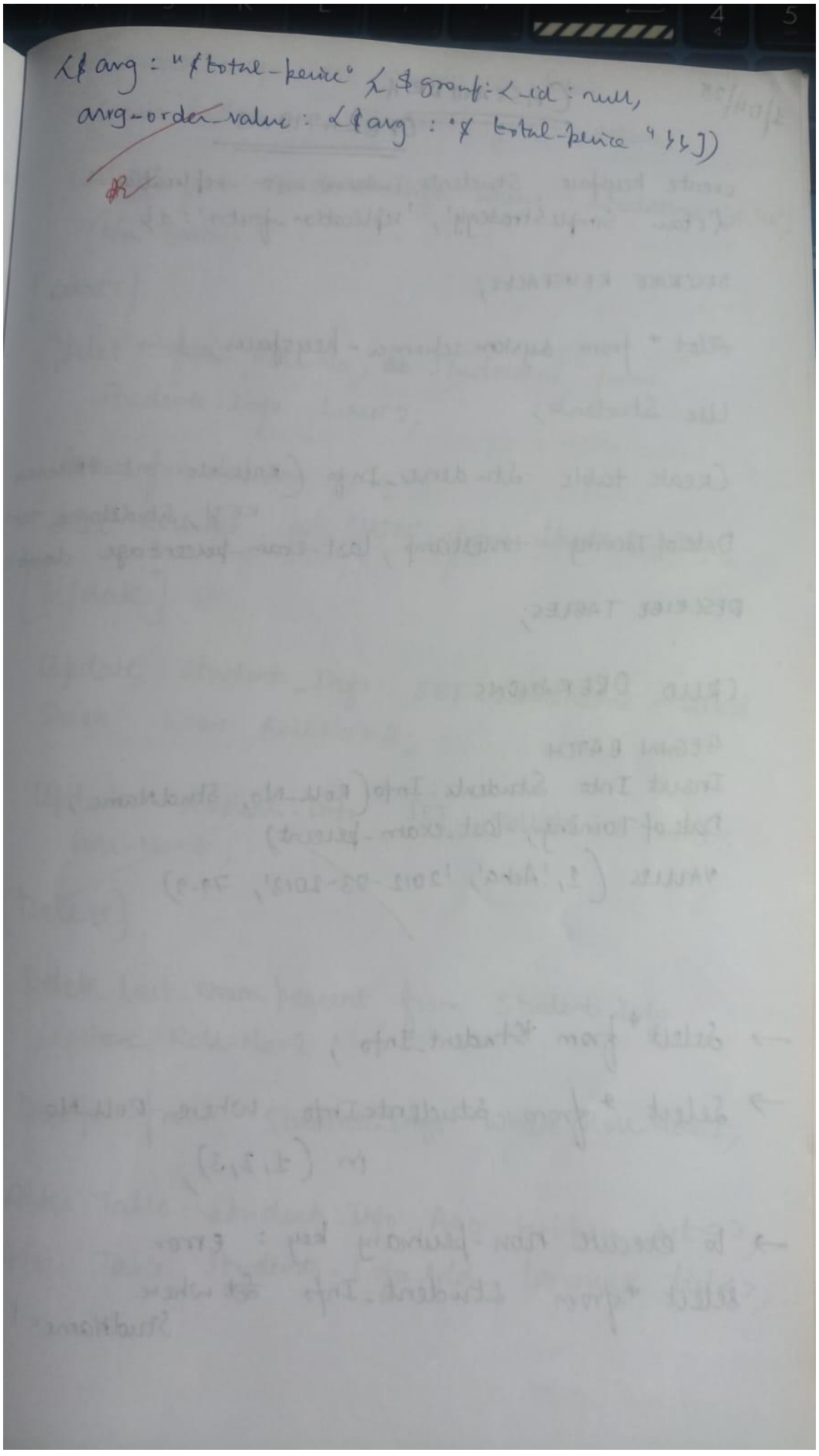
>db.Orders.agg([{$group: {_id: "$user_id", total_sent: {$sum: 1}}}])

6) Find users with highest total price of orders.

>db.order.aggregates([{$group: {_id: "$user_id", total_spent: {$sum: "$total_price"}}}, {$sort: {total_spent: -1}}, {$limit: 1}])

7) Find ~~average~~ total price

>db.orders.aggregate([{$group: {_id: null, avg_order_value:


$arg : "$total-price" $group: $id : null,
arg-order_value : $($arg : "$ total-price ", 1, 1])

Code & Output:

1. **Create a database “Student” with the following attributes Rollno, Name , Age, ContactNo, Email-Id, grade, hobby:**

use Students;

2. **Insert 5 appropriate values according to the below queries.**

db.students.insertMany([

{ "Rollno": 10, "Name": "John", "Age": 20, "ContactNo": "1234567890", "Email-Id": "john@example.com", "grade": "A", "hobby": "Reading" },

{ "Rollno": 11, "Name": "Alice", "Age": 21, "ContactNo": "9876543210", "Email-Id": "alice@example.com", "grade": "B", "hobby": "Painting" },

{ "Rollno": 12, "Name": "Bob", "Age": 22, "ContactNo": "2345678901", "Email-Id": "bob@example.com", "grade": "C", "hobby": "Cooking" },

{ "Rollno": 13, "Name": "Eve", "Age": 23, "ContactNo": "3456789012", "Email-Id": "eve@example.com", "grade": "A" },

{ "Rollno": 14, "Name": "Charlie", "Age": 24, "ContactNo": "4567890123", "Email-Id": "charlie@example.com", "hobby": "Gardening" }

```
Atlas atlas-wanmtx-shard-0 [primary] Student> use Students
switched to db Students
Atlas atlas-wanmtx-shard-0 [primary] Students> show collections

Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.insertMany([
...     { "Rollno": 10, "Name": "John", "Age": 20, "ContactNo": "1234567890", "Email-Id":
"john@example.com", "grade": "A", "hobby": "Reading" },
...     { "Rollno": 11, "Name": "Alice", "Age": 21, "ContactNo": "9876543210", "Email-Id":
 "alice@example.com", "grade":
 "B", "hobby": "Painting" },
...     { "Rollno": 12, "Name": "Bob", "Age": 22, "ContactNo": "2345678901", "Email-Id": "
bob@example.com", "grade": "C", "hobby": "Cooking" },
...     { "Rollno": 13, "Name": "Eve", "Age": 23, "ContactNo": "3456789012", "Email-Id": "
eve@example.com", "grade": "A"
 },
...     { "Rollno": 14, "Name": "Charlie", "Age": 24, "ContactNo": "4567890123", "Email-Id
": "charlie@example.com", "hobby": "Gardening" }
... ])
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId("661ce9dc76a00ff8cc51dae1"),
    '1': ObjectId("661ce9dc76a00ff8cc51dae2"),
    '2': ObjectId("661ce9dc76a00ff8cc51dae3"),
    '3': ObjectId("661ce9dc76a00ff8cc51dae4"),
    '4': ObjectId("661ce9dc76a00ff8cc51dae5")
  }
}
```
])

3. Write query to update Email-Id of a student with rollno 10.

db.students.updateOne(

{ "Rollno": 10 },

{ $set: { "Email-Id": "john.doe@example.com" } }

)

```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.updateOne(
...     { "Rollno": 10 },
...     { $set: { "Email-Id": "john.doe@example.com" } }
... )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

4. Replace the student name from “Alice” to “Alicee” of rollno 11

db.students.updateOne(

{ "Rollno": 11 },

{ $set: { "Name": "Alicee" } }

)

```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.updateOne(
...     { "Rollno": 11 },
...     { $set: { "Name": "Alicee" } }
... )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

5. **Display Student Name and grade(Add if grade is not present)where the _id column is 1.**

db.students.find({}, { "Name": 1, "grade": { $ifNull: ["$grade", "Not available"] }, "_id": 0 })

```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.find({}, { "Name": 1, "grade":
{ $ifNull: ["$grade", "Not available"] }, "_id": 0 })
[
  { Name: 'John', grade: 'A' },
  { Name: 'Alicee', grade: 'B' },
  { Name: 'Bob', grade: 'C' },
  { Name: 'Eve', grade: 'A' },
  { Name: 'Charlie', grade: 'Not available' }
]
```

6. **Update to add hobbies**

db.students.updateMany(

{ "Name": "Eve" },

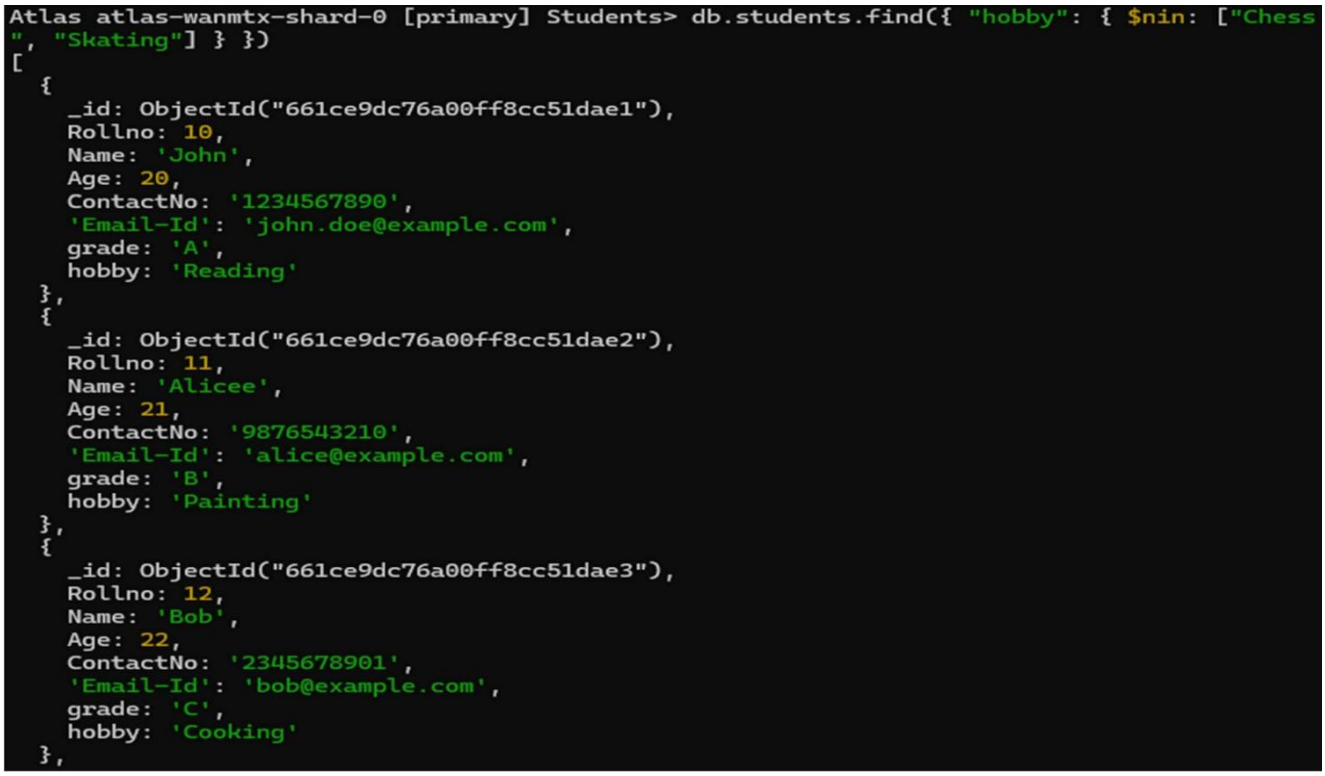
{ $set: { "hobby": "Dancing" } }

)

```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.updateMany(
...     { "Name": "Eve" },
...     { $set: { "hobby": "Dancing" } }
... )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

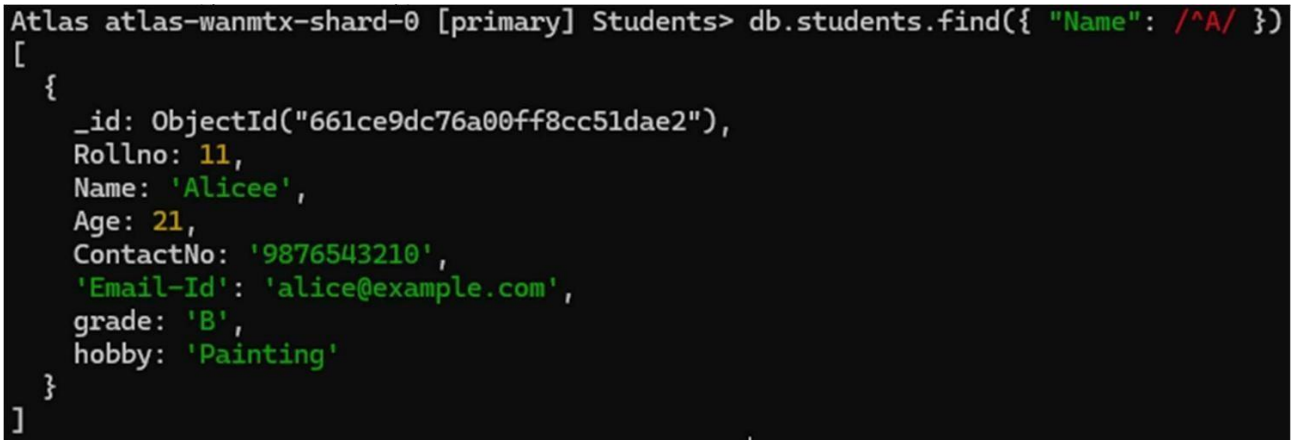
7. **Find documents where hobbies is set neither to Chess nor to Skating**

db.students.find({ "hobby": { $nin: ["Chess", "Skating"] } })



8. Find documents whose name begins with A

db.students.find({ "Name": /^A/ })



Experiment – 2

Q) Perform the following DB operations using Cassandra

a) Create a keyspace by name **Employee**

b) Create a column family by name **Employee-Info** with attributes
Emp_Id Primary Key, Emp_Name,
Designation, Date_of_Joining, Salary, Dept_Name

c) Insert the values into the table in **batch**

d) Update Employee name and Department of **Emp-Id 121**

e) Sort the details of Employee records based on **salary**

f) Alter the schema of the table **Employee_Info** to add a column **Projects** which stores a **set of Projects** done by the corresponding Employee.

g) Update the altered table to **add project names**

h) Create a **TTL of 15 seconds** to display the values of Employees

Screen Shot:

1/04/25

CASSANDRA OPERATIONS

```
create keyspace Students where with replication =
{'class': 'SimpleStrategy', 'replication_factor': 1};

DESCRIBE KEYSPACES;

select * from system.schema_keyspaces;

Use Students;

Create table Student_Info (ROLL_No int PRIMARY
KEY, StudName text,
Date of Joining timestamp, last_exam_percentage double);

DESCRIBE TABLES;
```

CRUD OPERATIONS :

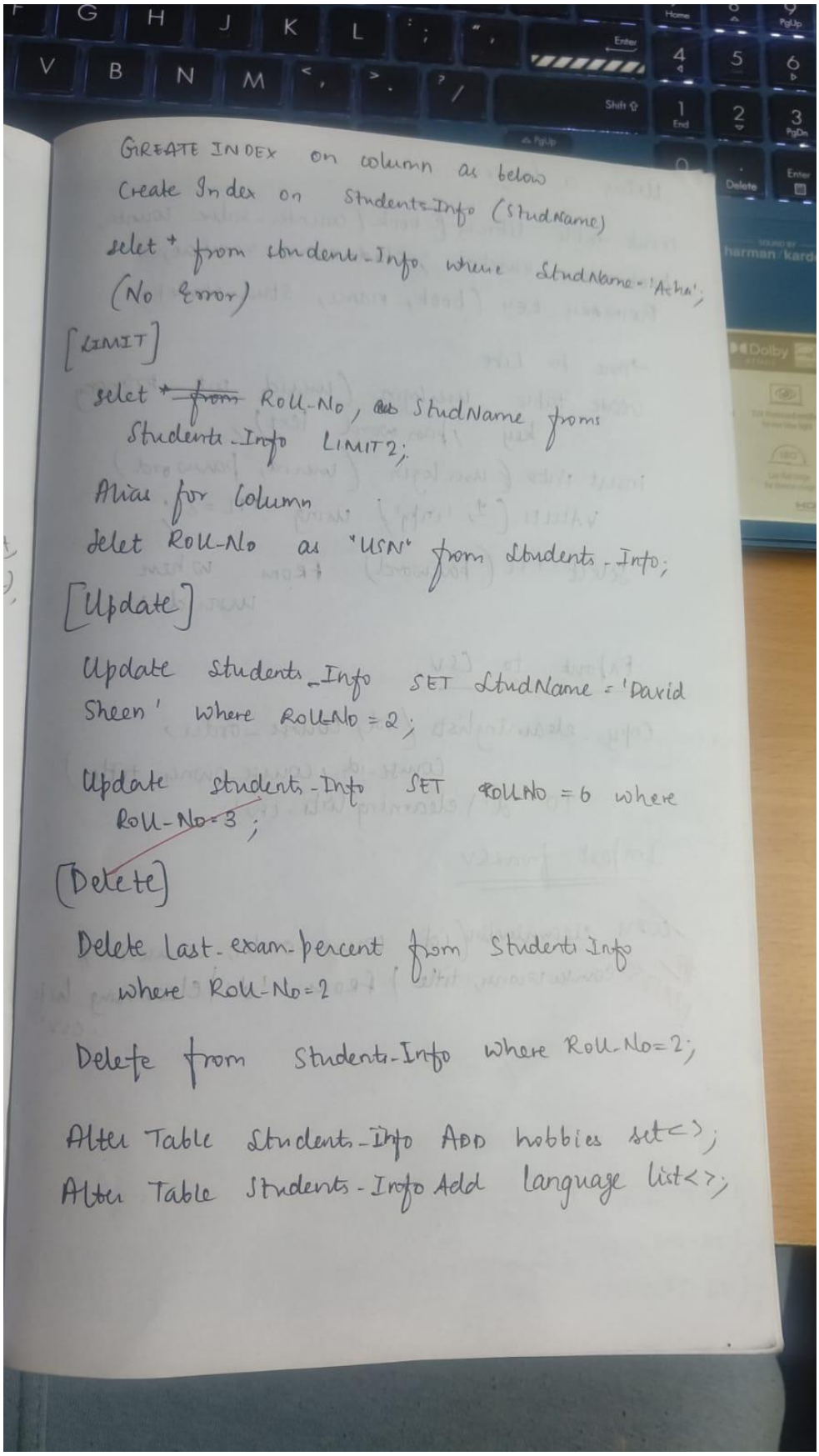
```
BEGIN BATCH
Insert Into Students_Info(Roll_No, StudName,
Date of Joining, last_exam_percent)
VALUES (1, 'Asha', '2012-03-2013', 79.9)
```

→ Select * from Student_Info ;

→ Select * from Students_Info where Roll_No in (1, 2, 3);

→ to execute non-primary key : error

Select * from Student_Info ~~st~~ where StudName = 'Asha';



GREATE INDEX on column as below

Create Index on Students_Info (StudName)

select * from students_Info where StudName = 'Asha';
(No Error)

[LIMIT]

select ~~* from~~ Roll_No, StudName from Students_Info LIMIT 2;

Alias for Column

delet Roll_No as "USN" from Students_Info;

[Update]

Update Students_Info SET StudName = 'David Sheen' where Roll_No = 2;

Update Students_Info SET RollNo = 6 where Roll_No = 3;

[Delete]

Delete last_exam_percent from Students Info where Roll_No = 2

Delete from Students_Info where Roll_No = 2;

Alter Table Students_Info ADD hobbies set<>;

Alter Table Students_Info Add language list<>;

Using a Counter;

```
create table library.book (counter_value counter,
book_name varchar, stud_name varchar,
PRIMARY KEY (book_name, stud_name));
```

Time to Live

```
create table userlogin (userid int primary
        key, password text);
insert into userlogin (userid, password)
    VALUES (1, 'info') using TTL = 30;
Select TTL (password) FROM where
                        userid=1
```

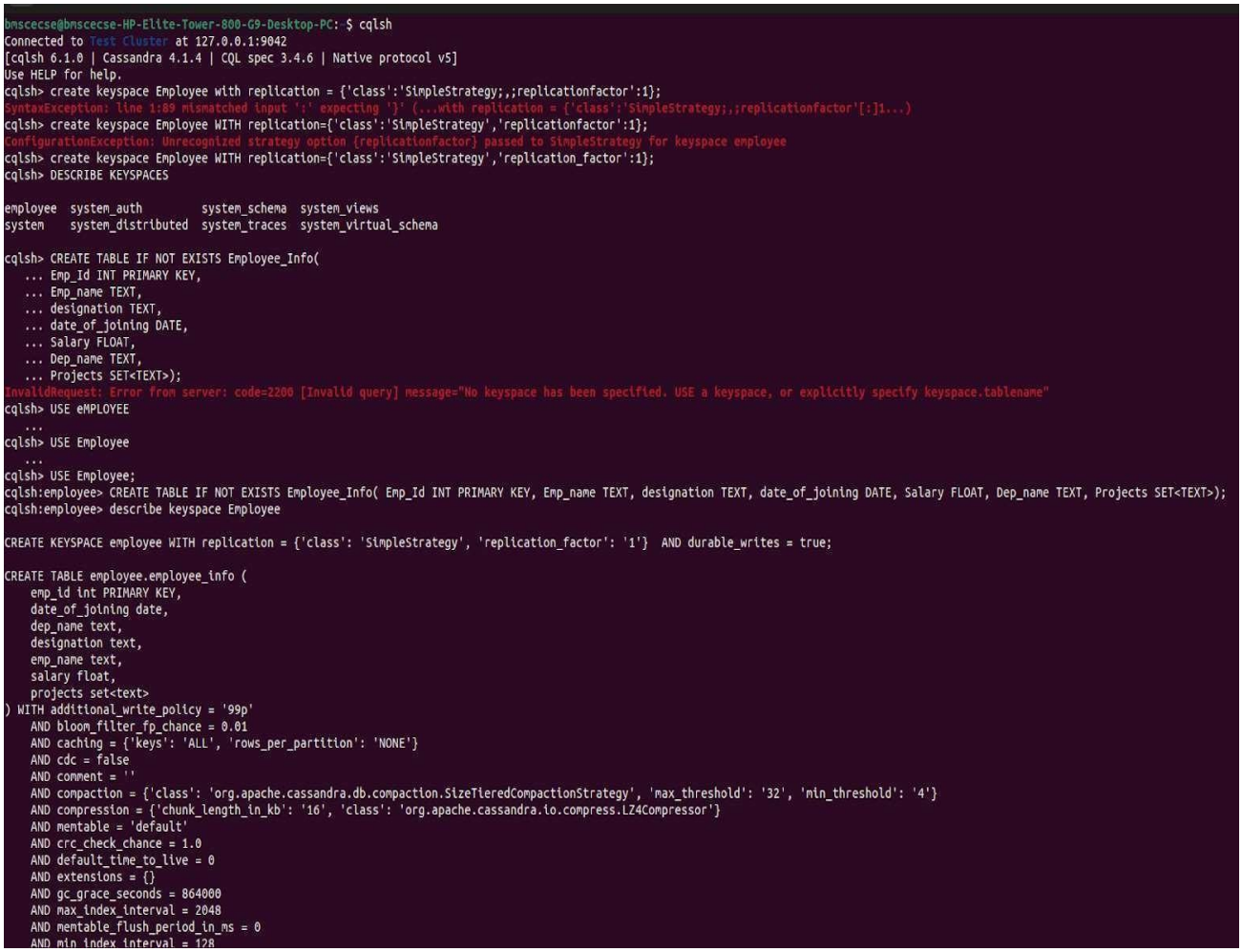
Export to CSV:

```
Copy elearninglists (id, course_order,
                course_id, course_owner, title)
    TO 'd:\elearning lists.csv';
```

Import from CSV

```
COPY elearninglists(id, course_order, course_id,
course_owner, title) FROM 'd:\elearning lists
                                .csv'
```

i) Code & Output:



```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC: $ cqlsh
Connected to Test Cluster at 127.0.0.1:9042
[cqlsh 6.1.0 | Cassandra 4.1.4 | CQL spec 3.4.6 | Native protocol v5]
Use HELP for help.
cqlsh> create keyspace Employee with replication = {'class':'SimpleStrategy;,;replicationfactor':1};
SyntaxException: line 1:89 mismatched input ':' expecting '}' (...with replication = {'class':'SimpleStrategy;,;replicationfactor'[:]1...)
cqlsh> create keyspace Employee WITH replication={'class':'SimpleStrategy','replicationfactor':1};
ConfigurationException: Unrecognized strategy option {replicationfactor} passed to SimpleStrategy for keyspace employee
cqlsh> create keyspace Employee WITH replication={'class':'SimpleStrategy','replication_factor':1};
cqlsh> DESCRIBE KEYSPACES

employee  system_auth         system_schema  system_views
system    system_distributed  system_traces  system_virtual_schema

cqlsh> CREATE TABLE IF NOT EXISTS Employee_Info(
   ... Emp_Id INT PRIMARY KEY,
   ... Emp_name TEXT,
   ... designation TEXT,
   ... date_of_joining DATE,
   ... Salary FLOAT,
   ... Dep_name TEXT,
   ... Projects SET<TEXT>);
InvalidRequest: Error from server: code=2200 [Invalid query] message="No keyspace has been specified. USE a keyspace, or explicitly specify keyspace.tablename"
cqlsh> USE eMPLOYEE
   ...
cqlsh> USE Employee
   ...
cqlsh> USE Employee;
cqlsh:employee> CREATE TABLE IF NOT EXISTS Employee_Info( Emp_Id INT PRIMARY KEY, Emp_name TEXT, designation TEXT, date_of_joining DATE, Salary FLOAT, Dep_name TEXT, Projects SET<TEXT>);
cqlsh:employee> describe keyspace Employee

CREATE KEYSPACE employee WITH replication = {'class': 'SimpleStrategy', 'replication_factor': '1'}  AND durable_writes = true;

CREATE TABLE employee.employee_info (
    emp_id int PRIMARY KEY,
    date_of_joining date,
    dep_name text,
    designation text,
    emp_name text,
    salary float,
    projects set<text>
) WITH additional_write_policy = '99p'
    AND bloom_filter_fp_chance = 0.01
    AND caching = {'keys': 'ALL', 'rows_per_partition': 'NONE'}
    AND cdc = false
    AND comment = ''
    AND compaction = {'class': 'org.apache.cassandra.db.compaction.SizeTieredCompactionStrategy', 'max_threshold': '32', 'min_threshold': '4'}
    AND compression = {'chunk_length_in_kb': '16', 'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
    AND memtable = 'default'
    AND crc_check_chance = 1.0
    AND default_time_to_live = 0
    AND extensions = {}
    AND gc_grace_seconds = 864000
    AND max_index_interval = 2048
    AND memtable_flush_period_in_ms = 0
    AND min_index_interval = 128
```

```
cqlsh:employee> update employee_info using ttl 15 set salary = 0 where emp_id = 121;
cqlsh:employee> select * from employee_info;

 emp_id | bonus | date_of_joining | dep_name    | designation | emp_name    | projects                          | salary
--------+-------+-----------------+-------------+-------------+-------------+-----------------------------------+---------
    120 | 12000 |      2024-05-06 | Engineering |   Developer | Priyanka GH |  {'Project B', 'ProjectA'} |   1e+06
    123 |  null |      2024-05-07 | Engineering |    Engineer |     Sadhana | {'Project M', 'Project P'} | 1.2e+06
    122 |  null |      2024-05-06 |  Management |          HR |     Rachana | {'Project C', 'Project M'} |   9e+05
    121 | 11000 |      2024-05-06 |  Management |   Developer |      Shreya |  {'Project C', 'ProjectA'} |       0

(4 rows)
cqlsh:employee> select * from employee_info;

 emp_id | bonus | date_of_joining | dep_name    | designation | emp_name    | projects                          | salary
--------+-------+-----------------+-------------+-------------+-------------+-----------------------------------+---------
    120 | 12000 |      2024-05-06 | Engineering |   Developer | Priyanka GH |  {'Project B', 'ProjectA'} |   1e+06
    123 |  null |      2024-05-07 | Engineering |    Engineer |     Sadhana | {'Project M', 'Project P'} | 1.2e+06
    122 |  null |      2024-05-06 |  Management |          HR |     Rachana | {'Project C', 'Project M'} |   9e+05
    121 | 11000 |      2024-05-06 |  Management |   Developer |      Shreya |  {'Project C', 'ProjectA'} |    null

(4 rows)
cqlsh:employee>
```

```
    AND speculative_retry = '99p';
cqlsh:employee> select * from employee_info;

 emp_id | date_of_joining | dep_name    | designation | emp_name | projects                          | salary
--------+-----------------+-------------+-------------+----------+-----------------------------------+---------
    120 |      2024-05-06 | Engineering |   Developer | Priyanka |  {'Project B', 'ProjectA'} |   1e+06
    123 |      2024-05-07 | Engineering |    Engineer |  Sadhana | {'Project M', 'Project P'} | 1.2e+06
    122 |      2024-05-06 |  Management |          HR |  Rachana | {'Project C', 'Project M'} |   9e+05
    121 |      2024-05-06 |  Management |   Developer |   Shreya |  {'Project C', 'ProjectA'} |   9e+05

(4 rows)
cqlsh:employee> update employee_info set emp_name = 'Priyanka GH' Where emp_id = '120';
InvalidRequest: Error from server: code=2200 [Invalid query] message="Invalid STRING constant (120) for "emp_id" of type int"
cqlsh:employee> update employee_info set emp_name = 'Priyanka GH' Where emp_id=120;
cqlsh:employee> select * from employee_info;

 emp_id | date_of_joining | dep_name    | designation | emp_name    | projects                          | salary
--------+-----------------+-------------+-------------+-------------+-----------------------------------+---------
    120 |      2024-05-06 | Engineering |   Developer | Priyanka GH |  {'Project B', 'ProjectA'} |   1e+06
    123 |      2024-05-07 | Engineering |    Engineer |     Sadhana | {'Project M', 'Project P'} | 1.2e+06
    122 |      2024-05-06 |  Management |          HR |     Rachana | {'Project C', 'Project M'} |   9e+05
    121 |      2024-05-06 |  Management |   Developer |      Shreya |  {'Project C', 'ProjectA'} |   9e+05

(4 rows)
cqlsh:employee> select * from employee_info order by salary;
InvalidRequest: Error from server: code=2200 [Invalid query] message="ORDER BY is only supported when the partition key is restricted by an EQ or an IN."
cqlsh:employee> alter table employee_info add bonus INT;
cqlsh:employee> select * from employee_info;

 emp_id | bonus | date_of_joining | dep_name    | designation | emp_name    | projects                          | salary
--------+-------+-----------------+-------------+-------------+-------------+-----------------------------------+---------
    120 |  null |      2024-05-06 | Engineering |   Developer | Priyanka GH |  {'Project B', 'ProjectA'} |   1e+06
    123 |  null |      2024-05-07 | Engineering |    Engineer |     Sadhana | {'Project M', 'Project P'} | 1.2e+06
    122 |  null |      2024-05-06 |  Management |          HR |     Rachana | {'Project C', 'Project M'} |   9e+05
    121 |  null |      2024-05-06 |  Management |   Developer |      Shreya |  {'Project C', 'ProjectA'} |   9e+05

(4 rows)
cqlsh:employee> update employee_info set bonus = 12000 where emp_id = 120;
cqlsh:employee> select * from employee_info;

 emp_id | bonus | date_of_joining | dep_name    | designation | emp_name    | projects                          | salary
--------+-------+-----------------+-------------+-------------+-------------+-----------------------------------+---------
    120 | 12000 |      2024-05-06 | Engineering |   Developer | Priyanka GH |  {'Project B', 'ProjectA'} |   1e+06
    123 |  null |      2024-05-07 | Engineering |    Engineer |     Sadhana | {'Project M', 'Project P'} | 1.2e+06
    122 |  null |      2024-05-06 |  Management |          HR |     Rachana | {'Project C', 'Project M'} |   9e+05
    121 |  null |      2024-05-06 |  Management |   Developer |      Shreya |  {'Project C', 'ProjectA'} |   9e+05

(4 rows)
cqlsh:employee> update employee_info set bonus = 11000 where emp_id = 121;
cqlsh:employee> select * from employee_info using ttl 15 where emp_id = 123;
SyntaxException: line 1:28 mismatched input 'using' expecting EOF (select * from employee_info [using] ttl...)
cqlsh:employee> select * from employee_info where emp_id = 121 using ttl 15;
SyntaxException: line 1:47 no viable alternative at input 'using' (...employee_info where emp_id = 121 [using]...)
cqlsh:employee> update employee_info using ttl 15 set salary = 0 where emp_id = 121;
cqlsh:employee> select * from employee_info;
```

Experiment – 3

Q) Perform the following DB operations using Cassandra

a) Create a keyspace by name **Library**

b) Create a column family by name **Library-Info** with attributes
Stud_Id Primary Key,
Counter_value of type **Counter**,
Stud_Name, **Book-Name**, **Book-Id**,
Date_of_issue

c) Insert the values into the table in **batch**

d) Display the details of the table created and **increase the value of the counter**

e) Write a query to show that a student with **id 112** has taken a book **"BDA" 2 times**

f) **Export** the created column to a **CSV file**

g) **Import** a given CSV dataset from **local file system** into Cassandra **column family**

Screenshot:

8/4/24

LAB-
CASSANDRA OPERATIONS

1. Create Keyspace

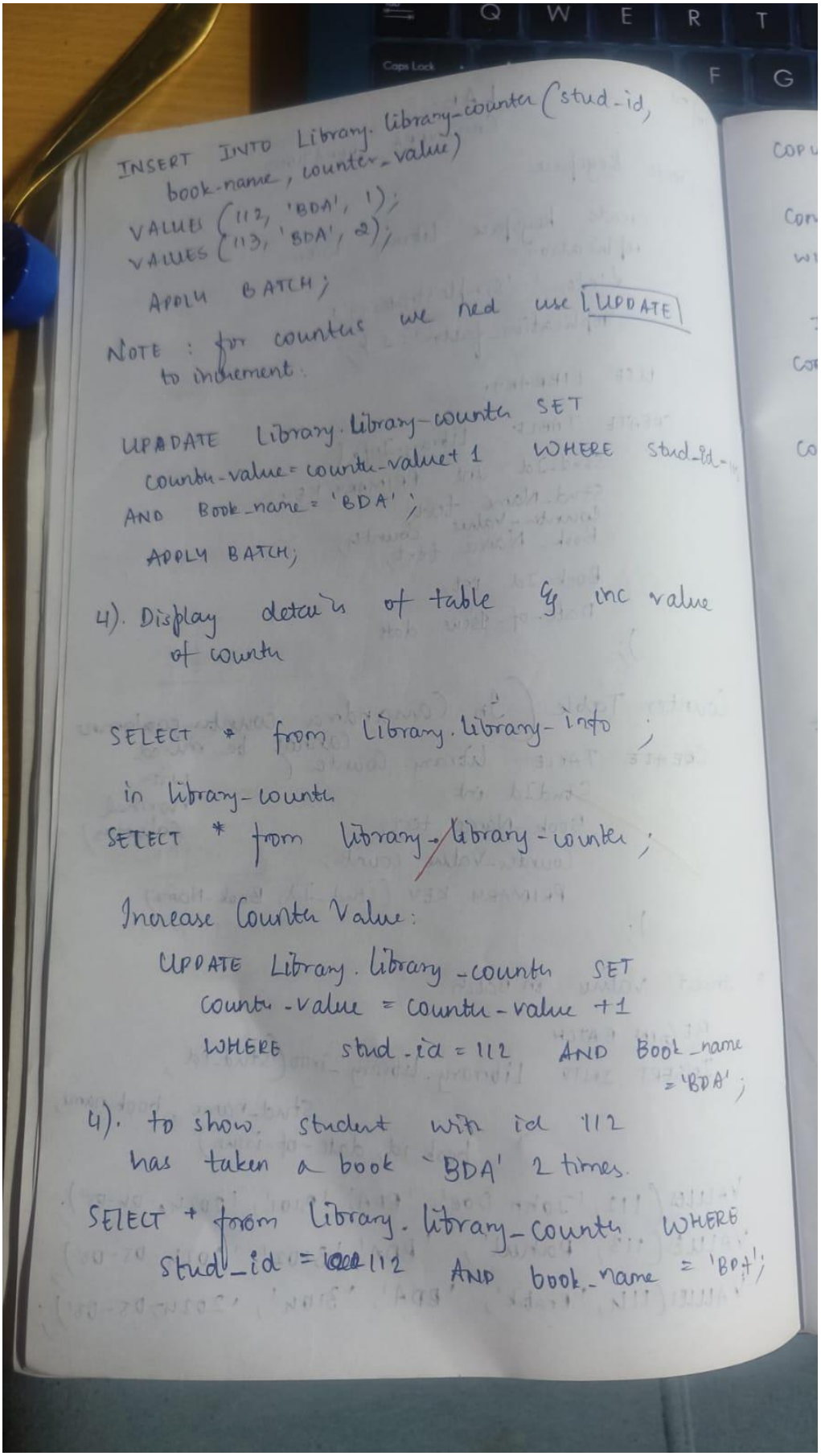
```
Create keyspace library with
replication =
{'class': 'SimpleStrategy',
'replication_factor': 1};

USE LIBRARY;

CREATE TABLE Library-Info (
    Stud-Id int PRIMARY KEY,
    Stud_Name text
    Counter_Value counter,
    Book_Name text,
    Book_Id int,
    Date-of-Issue date
);
```

Counter Table: (In Cassandra counter columns cannot be mixed with normal columns)

```
CREATE TABLE Library_Counter (
    StudId int,
    Book_Name text,
    Counter_Value counter,
    PRIMARY KEY (Stud_Id, Book_Name)
);
```

3. Insert Values in Batch:

```
BEGIN BATCH
INSERT INTO Library.library_info(stud_id,
                stud_name, book_name,
                book_id, date_of_issue)
VALUES(112, 'John Doe', 'BDA', '3101', '2024-04-08');
VALUES(113, 'Rahul', 'BDA', '3102', '2024-05-08');
VALUES(114, 'Pratik', 'BDA', '3104', '2024-05-08');
```



```
INSERT INTO Library.library-counter (stud_id,
    book-name, counter_value)
VALUES (112, 'BDA', 1);
VALUES (113, 'BDA', 2);
APPLY BATCH;
```

NOTE : for counters we need use UPDATE to increment.

```
UPDATE Library.library-counter SET
counter-value = counter-value+1 WHERE stud_id=
AND Book_name = 'BDA';
APPLY BATCH;
```

4). Display details of table & inc value of counter

```
SELECT * from Library.library-info ;
```

in library-counter

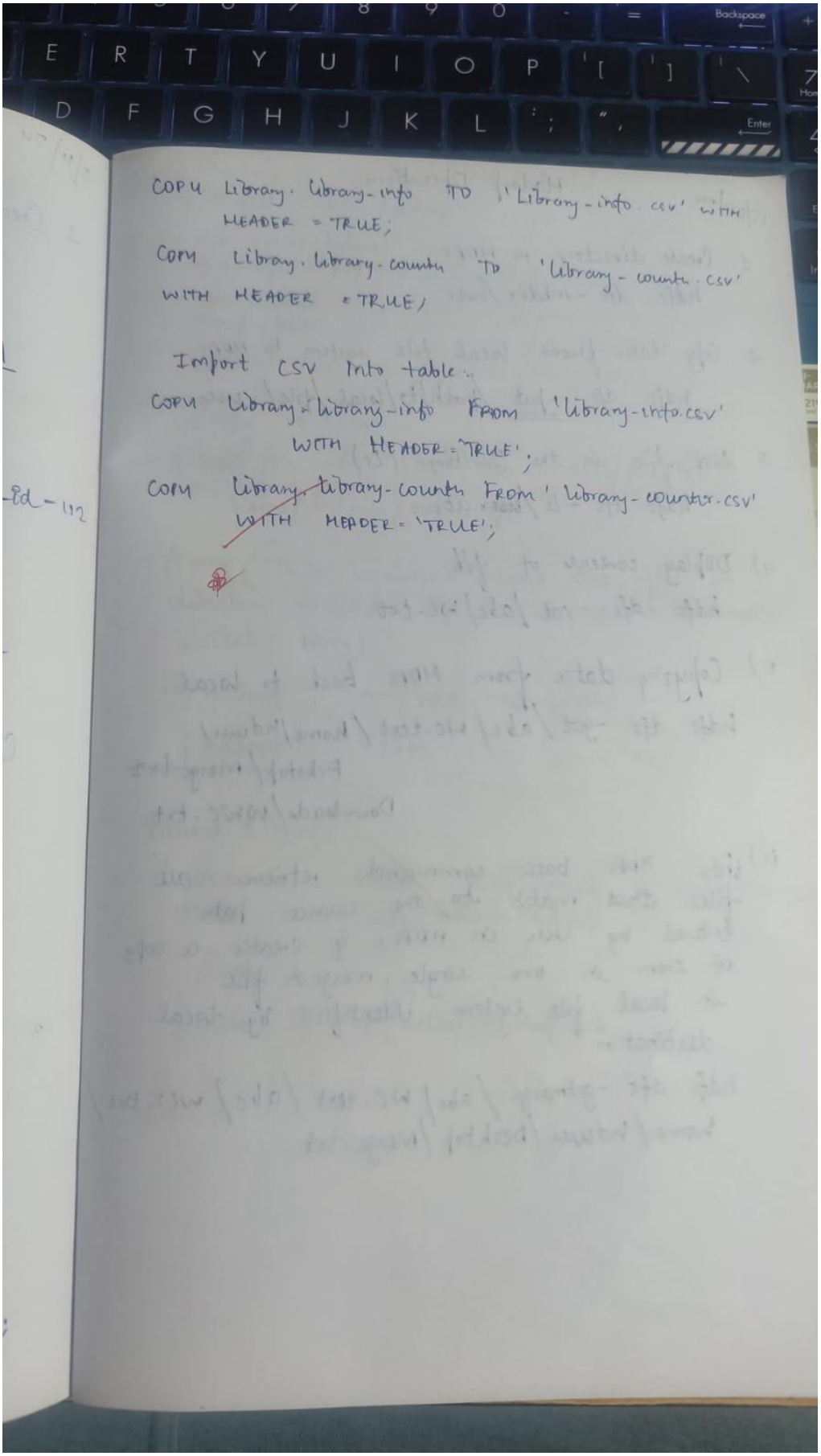
```
SELECT * from library-library-counter ;
```

Increase Counter Value:

```
UPDATE Library.library-counter SET
    counter-value = counter-value +1
    WHERE stud-id = 112 AND Book_name
    = 'BDA';
```

4). to show student with id 112 has taken a book 'BDA' 2 times.

```
SELECT * from Library.library-counter WHERE
    stud_id = 112 AND book_name = 'BDA';
```



COPY Library.Library-info TO 'Library-info.csv' WITH HEADER = TRUE;

COPY Library.Library-counts TO 'Library-counts.csv' WITH HEADER = TRUE;

Import CSV into table:

COPY Library-Library-info FROM 'Library-info.csv' WITH HEADER = 'TRUE';

COPY Library.Library-counts FROM 'Library-counter.csv' WITH HEADER = 'TRUE';

Code & Output:

```
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042
[cqlsh 6.1.0 | Cassandra 4.1.4 | CQL spec 3.4.6 | Native protocol v5]
Use HELP for help.
cqlsh> CREATE KEYSPACE Students WITH REPLICATION={
   ... 'class':'SimpleStrategy','replication_factor':1};
cqlsh> DESCRIBE KEYSPACES

students  system_auth         system_schema  system_views
system    system_distributed  system_traces  system_virtual_schema

cqlsh> SELECT * FROM system.schema_keyspaces;
InvalidRequest: Error from server: code=2200 [Invalid query] message="table schema_keyspaces does not exist"
cqlsh> use Students;
cqlsh:students> create table Students_info(Roll_No int Primary key,StudName text,DateOfJoining timestamp,last_exam_Percent double);
cqlsh:students> describe tables;

students_info

cqlsh:students> describe table students;
Table 'students' not found in keyspace 'students'
cqlsh:students> describe table students_info;

CREATE TABLE students.students_info (
    roll_no int PRIMARY KEY,
    dateofjoining timestamp,
    last_exam_percent double,
    studname text
) WITH additional_write_policy = '99p'
    AND bloom_filter_fp_chance = 0.01
    AND caching = {'keys': 'ALL', 'rows_per_partition': 'NONE'}
    AND cdc = false
    AND comment = ''
    AND compaction = {'class': 'org.apache.cassandra.db.compaction.SizeTieredCompactionStrategy', 'max_threshold': '32', 'min_threshold': '4'}
    AND compression = {'chunk_length_in_kb': '16', 'class': 'org.apache.cassandra.io.compress.LZ4Compressor'}
    AND memtable = 'default'
    AND crc_check_chance = 1.0
    AND default_time_to_live = 0
    AND extensions = {}
    AND gc_grace_seconds = 864000
    AND max_index_interval = 2048
    AND memtable_flush_period_in_ms = 0
    AND min_index_interval = 128
    AND read_repair = 'BLOCKING'
    AND speculative_retry = '99p';
```

```
cqlsh:students> Begin batch insert into Students_info(Roll_no, StudName,DateOfJoining, last_exam_Percent) values(1,'Sadhana','2023-10-09', 98) insert into Students_info(Roll_no, StudName,DateOfJoining, last_exam
_Percent) values(2,'Rutu','2023-10-10', 97) insert into Students_info(Roll_no, StudName,DateOfJoining, last_exam_Percent) values(3,'Rachana','2023-10-10', 97.5) insert into Students_info(Roll_no, StudName,DateOf
Joining, last_exam_Percent) values(4,'Charu','2023-10-06', 96.5) apply batch;
cqlsh:students> select * from students_info;

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       1 | 2023-10-08 18:30:00.000000+0000 |                98 |  Sadhana
       2 | 2023-10-09 18:30:00.000000+0000 |                97 |     Rutu
       4 | 2023-10-05 18:30:00.000000+0000 |              96.5 |    Charu
       3 | 2023-10-09 18:30:00.000000+0000 |              97.5 |  Rachana

(4 rows)
cqlsh:students> select * from students_info where roll_no in (1,2,3);

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       1 | 2023-10-08 18:30:00.000000+0000 |                98 |  Sadhana
       2 | 2023-10-09 18:30:00.000000+0000 |                97 |     Rutu
       3 | 2023-10-09 18:30:00.000000+0000 |              97.5 |  Rachana

(3 rows)
cqlsh:students> select * from students_info where Studname='Charu';
InvalidRequest: Error from server: code=2200 [Invalid query] message="Cannot execute this query as it might involve data filtering and thus may have unpredictable performance. If you want to execute this query d
espite the performance unpredictability, use ALLOW FILTERING"
cqlsh:students> create index on Students_info(StudName);
cqlsh:students> select * from students_info where Studname='Charu';

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       4 | 2023-10-05 18:30:00.000000+0000 |              96.5 |    Charu

(1 rows)
cqlsh:students> select Roll_no,StudName from students_info LIMIT 2;
```

```
(4 rows)
cqlsh:students> select * from students_info where roll_no in (1,2,3);

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       1 | 2023-10-08 18:30:00.000000+0000 |                98 |  Sadhana
       2 | 2023-10-09 18:30:00.000000+0000 |                97 |     Rutu
       3 | 2023-10-09 18:30:00.000000+0000 |              97.5 |  Rachana

(3 rows)
cqlsh:students> select * from students_info where Studname='Charu';
InvalidRequest: Error from server: code=2200 [Invalid query] message="Cannot execute this query as it might involve data filtering and thus may have unpredictable performance. If you want to execute this query d
espite the performance unpredictability, use ALLOW FILTERING"
cqlsh:students> create index on Students_info(StudName);
cqlsh:students> select * from students_info where Studname='Charu';

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       4 | 2023-10-05 18:30:00.000000+0000 |              96.5 |    Charu

(1 rows)
cqlsh:students> select Roll_no,StudName from students_info LIMIT 2;

 roll_no | studname
---------+----------
       1 |  Sadhana
       2 |     Rutu

(2 rows)
cqlsh:students> SELECT Roll_no as "USN" from Students_info;

 USN
-----
   1
   2
   4
   3
```

Experiment - 4

Q) Execution of HDFS Commands for interaction with Hadoop Environment. (Minimum 10 commands to be executed)

Screenshot:

15/04/24

Hadoop Operations

1. Create directory in HDFS
   hdfs dfs -mkdir /user

2. Copy data from local file system to HDFS
   hdfs dfs -put /path/to/local/file/ user

3 List file in the Directory (ls)
   hdfs dfs -ls /~~user~~ abc

4) Display contents of file:
   hdfs dfs -cat /abc/WC.txt

5) Copying data from HDFS back to local.
   hdfs dfs -get /abc/WC.text /home/hduser/
   ~~Dekstop/Merge.txt~~
   Downloads/WWC.txt

ii) this HDFS basic command retrieves all files that match to the source path entered by user in HDFS, & creates a copy of them in one single, merged file in local file system identified by local destination.

   hdfs dfs -getmerge /abc/WC.text /abc/WC2.txt/
   home/hduser/Desktop/Merge.txt

$ hadoop fs -getfacl /bda-hadoop/
#file : /bda_hadoop
owner: hduser
group: supergroup
user::rwx
group::rwx
other::r-x

//copy to Local
$ hdfs dfs -copyToLocal /bda_hadoop/file_txt /
home/hduser/Desktop

//mv (This command moves the file or directory indicated by the source to destination within HDFS)

$ hadoop fs -mv /bda_hadoop/abc
$ hadoop fs -ls /abc

Found 1 items
drwxr-xr-x hduser supergroup 0 2022-06-06 15:52 15:20 /abc/bda-hadoop

//copy
$ hadoop fs -cp /hello//hadoop_lab

15/4/25

Code & Output:

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd ./Desktop/
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [bmscecse-HP-Elite-Tower-800-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mkdir /Lab05
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Hadoop
ls: `/Hadoop': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ touch test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -put ./text.txt /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
Found 1 items
-rw-r--r--   1 hadoop supergroup         19 2024-05-13 14:33 /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab05/text.txt
Hello
How are you?
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
Found 2 items
-rw-r--r--   1 hadoop supergroup         15 2024-05-13 14:40 /Lab05/test.txt
-rw-r--r--   1 hadoop supergroup         19 2024-05-13 14:33 /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab05 /text.txt /Lab05 /test.txt ../
Downloads/Merged.txt
getmerge: `/text.txt': No such file or directory
getmerge: `/test.txt': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab05/text.txt /Lab05/test.txt ../Do
wnloads/Merged.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -getfacl /Lab05
# file: /Lab05
# owner: hadoop
# group: supergroup
user::rwx
group::r-x
other::r-x
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/text.txt ../Documents
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/test.txt ../Documents
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab05/text.txt
Hello
How are you?
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mv /Lab05 /test_Lab05
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r--   1 hadoop supergroup         15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r--   1 hadoop supergroup         19 2024-05-13 14:33 /test_Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cp /test_Lab05/ /Lab05
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /Lab05
Found 2 items
-rw-r--r--   1 hadoop supergroup         15 2024-05-13 14:51 /Lab05/test.txt
-rw-r--r--   1 hadoop supergroup         19 2024-05-13 14:51 /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r--   1 hadoop supergroup         15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r--   1 hadoop supergroup         19 2024-05-13 14:33 /test_Lab05/text.txt
```

Experiment - 5

Q) Implement Wordcount program on Hadoop framework

Screenshot:

```
// importing libraries.
import java.io.IOEXCEPTION;
import java.io.IOException;
import org.apache.hadoop.io.LongWritable
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.Mapper;
import org.apache.hadoop.mapred.OutputCollector;

public class WCMapper extends MapReduceBase
implements Mapper<LongWritable, Text, Text,
                                IntWritable>{

  //Map function
  public void map(LongWritable key,
  Text value, OutputCollector<Text,
      IntWritable> output, Reporter rep)
                                throws IOException
{
  String line = value.toString();
  //Splitting the line on spaces
  for (String word : line.split(" "))
  {
    if (word.length() > 0)
    {
      Output.Collect(new Text(
                        word),
        new IntWritable(1));
    }
  }
}
```

Reducer Code:

```
/* import all the required library */
public class WCReducer extends MapReduce
Base implements Reducer <Text, IntWrita >,
                Text, Int Writable >{
public void reduce (Text key, Iterator
    Text, Int Writable > Output
<IntWritable> value, Output Collector <
    Text, Int Writable> Output,
        Reporter r|> throws IOException
{
    int count =0;
    while (value.hasNext())
        {
            IntWritable i = value.next();
            count+= i.get()
        }
    Output.Collect (key, new
            IntWritable (count));
}
}
```

08
20/5

Code & Output:

Mapper Code: WCMapper.java

java

CopyEdit

```
import java.io.IOException;

import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.io.LongWritable;

import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapred.MapReduceBase;

import org.apache.hadoop.mapred.Mapper;

import org.apache.hadoop.mapred.OutputCollector;

import org.apache.hadoop.mapred.Reporter;


public class WCMapper extends MapReduceBase implements Mapper<LongWritable, Text, Text, IntWritable> {

    public void map(LongWritable key, Text value, OutputCollector<Text, IntWritable> output, Reporter rep) throws IOException {

        String line = value.toString();

        for (String word : line.split(" ")) {

            if (word.length() > 0) {

                output.collect(new Text(word), new IntWritable(1));

            }

        }

    }

}
```

Reducer Code: WCReducer.java

java

CopyEdit

```
import java.io.IOException;
import java.util.Iterator;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.MapReduceBase;
import  org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reducer;
import org.apache.hadoop.mapred.Reporter;

public class WCReducer extends MapReduceBase implements Reducer<Text, IntWritable, Text, IntWritable> {
   public void reduce(Text key, Iterator<IntWritable> value, OutputCollector<Text, IntWritable> output, Reporter rep) throws IOException {
      int count = 0;
      while (value.hasNext()) {
         IntWritable i = value.next();
         count += i.get();
      }
      output.collect(key, new IntWritable(count));
   }
}
```

Driver Code: WCDriver.java

java

CopyEdit

```
import java.io.IOException;
import org.apache.hadoop.conf.Configured;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
```

```
import org.apache.hadoop.mapred.FileInputFormat;
import org.apache.hadoop.mapred.FileOutputFormat;
import org.apache.hadoop.mapred.JobClient;
import org.apache.hadoop.mapred.JobConf;
import org.apache.hadoop.util.Tool;
import org.apache.hadoop.util.ToolRunner;

public class WCDriver extends Configured implements Tool {
   public int run(String args[]) throws IOException {
      if (args.length < 2) {
         System.out.println("Please give valid inputs");
         return -1;
      }

      JobConf conf = new JobConf(WCDriver.class);
      FileInputFormat.setInputPaths(conf, new Path(args[0]));
      FileOutputFormat.setOutputPath(conf, new Path(args[1]));

      conf.setMapperClass(WCMapper.class);
      conf.setReducerClass(WCReducer.class);
      conf.setMapOutputKeyClass(Text.class);
      conf.setMapOutputValueClass(IntWritable.class);
      conf.setOutputKeyClass(Text.class);
      conf.setOutputValueClass(IntWritable.class);

      JobClient.runJob(conf);
      return 0;
   }

   public static void main(String args[]) throws Exception {
      int exitCode = ToolRunner.run(new WCDriver(), args);
```

```
        System.out.println(exitCode);
    }
}
```

Input File -> big data hadoop big data analytics
map reduce big data

Output:

(big, 1)

(data, 1)

(hadoop, 1)

(big, 1)

(data, 1)

(analytics, 1)

(map, 1)

(reduce, 1)

(big, 1)

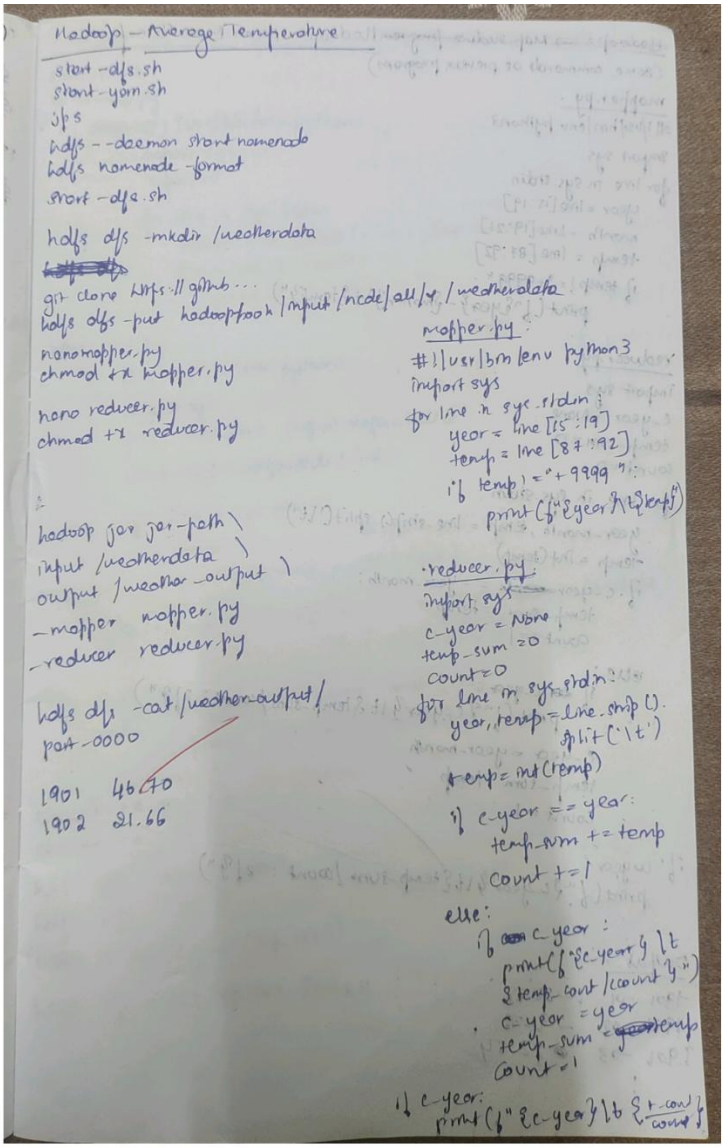
(data, 1)

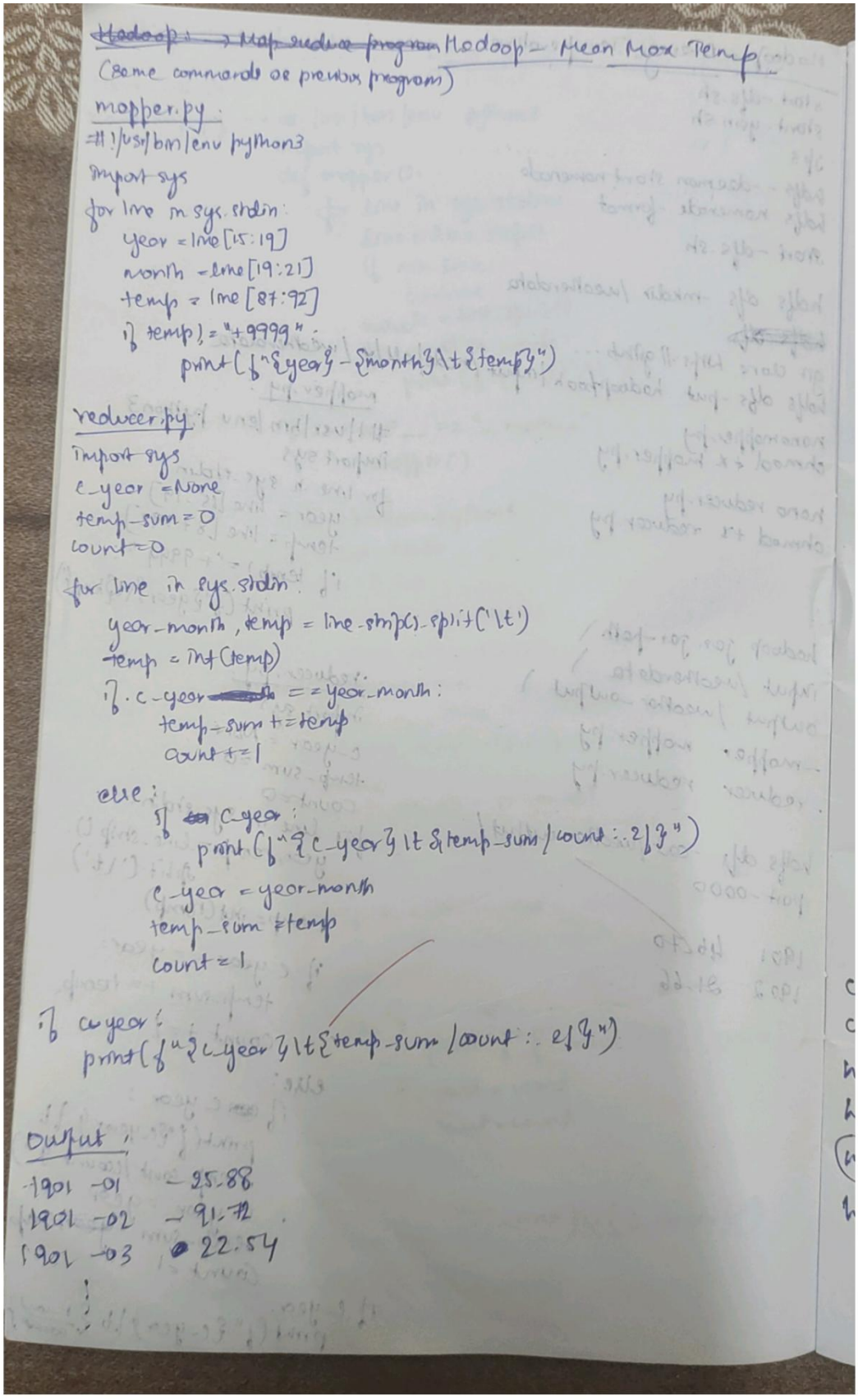
Experiment – 6

Q) From the following link extract the weather data
https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all

Create a Map Reduce program to
a) find average temperature for each year from NCDC data set.
b) find the mean max temperature for every month.

Screenshot:





Hadoop: Map reduce program Hadoop - Mean Max Temp

(Same commands as previous program)

mapper.py:

```
#!/usr/bin/env python3
import sys
for line in sys.stdin:
    year = line[15:19]
    month = line[19:21]
    temp = line[87:92]
    if temp != "+9999":
        print(f"{year}-{month}\t{temp}")
```

reducer.py:

```
import sys
c_year = None
temp_sum = 0
count = 0

for line in sys.stdin:
    year_month, temp = line.strip().split('\t')
    temp = int(temp)
    if c_year == year_month:
        temp_sum += temp
        count += 1
    else:
        if c_year:
            print(f"{c_year}\t{temp_sum/count:.2f}")
        c_year = year_month
        temp_sum = temp
        count = 1

if c_year:
    print(f"{c_year}\t{temp_sum/count:.2f}")
```

Output:

```
1901-01  -25.88
1901-02  -91.72
1901-03  22.54
   :
```

Code & Output:

a) Find average temperature for each year from NCDC data set

```
 GNU nano 7.2                                                    map.py *
import sys
for line in sys.stdin:
        year=line[15:19]
        temp=line[87:92]
        if temp!="+9999":
                print(f"{year}\t{temp}")
```

```
 GNU nano 7.2                                                    red.py *
import sys

current_year = None
temp_sum = 0
count = 0

for line in sys.stdin:
    year, temp = line.strip().split('\t')
    temp = int(temp)

    if current_year == year:
        temp_sum += temp
        count += 1
    else:
        if current_year:
            print(f"{current_year}\t{temp_sum/count:.2f}")
        current_year = year
        temp_sum = temp
        count = 1

# print last year
if current_year:
    print(f"{current_year}\t{temp_sum/count:.2f}")
```

```
ganajana@Anonymous:~$ hdfs dfs -mkdir /weatherdata
ganajana@Anonymous:~$ git clone https://github.com/tomwhite/hadoop-book.git
fatal: destination path 'hadoop-book' already exists and is not an empty directory.
ganajana@Anonymous:~$ git clone https://github.com/tomwhite/hadoop-book.git
Cloning into 'hadoop-book'...
remote: Enumerating objects: 4969, done.
remote: Total 4969 (delta 0), reused 0 (delta 0), pack-reused 4969 (from 1)
Receiving objects: 100% (4969/4969), 2.85 MiB | 6.78 MiB/s, done.
Resolving deltas: 100% (1945/1945), done.
ganajana@Anonymous:~$ hdfs dfs -put hadoop-book/input/ncdc/all/*/weatherdata
put: '.': No such file or directory: 'hdfs://localhost:9000/user/ganajana'
ganajana@Anonymous:~$ hdfs dfs -ls /
Found 1 items
drwxr-xr-x   - ganajana supergroup          0 2025-05-26 16:27 /weatherdata
ganajana@Anonymous:~$ hdfs dfs -put hadoop-book/input/ncdc/all/*/weatherdata
put: '.': No such file or directory: 'hdfs://localhost:9000/user/ganajana'
ganajana@Anonymous:~$ hdfs dfs -put hadoop-book/input/ncdc/all/* /weatherdata
ganajana@Anonymous:~$ nano map.py
ganajana@Anonymous:~$ chmod +x map.py
ganajana@Anonymous:~$ nano red.py
ganajana@Anonymous:~$ chmod +x red.py
ganajana@Anonymous:~$ hadoop jar $HADOOP_HOME/share/hadoop/tools/lib/hadoop-streaming-3.4.1.jar -input /weatherdata -output /weatherdata/out -mapper map.py
-reducer red.py
```

```
Mean Temperature: 31.18
```

b) Find the mean max temperature for every month

```
 GNU nano 7.2                                                    map.py *
import sys

for line in sys.stdin:
    year = line[15:19]
    month = line[19:21]  # extract month from positions 19-20
    temp = line[87:92]
    if temp != "+9999":  # valid temperature
        print(f"{year}-{month}\t{temp}")
```

```
 GNU nano 7.2                                                    red.py *
import sys

current_year_month = None
temp_sum = 0
count = 0

for line in sys.stdin:
    year_month, temp = line.strip().split('\t')
    temp = int(temp)

    if current_year_month == year_month:
        temp_sum += temp
        count += 1
    else:
        if current_year_month:
            print(f"{current_year_month}\t{temp_sum/count:.2f}")
        current_year_month = year_month
        temp_sum = temp
        count = 1

# print last year-month
if current_year_month:
    print(f"{current_year_month}\t{temp_sum/count:.2f}")
```

```
ganajana@Anonymous:~$ hdfs dfs -mkdir /weatherdata
ganajana@Anonymous:~$ git clone https://github.com/tomwhite/hadoop-book.git
fatal: destination path 'hadoop-book' already exists and is not an empty directory.
ganajana@Anonymous:~$ git clone https://github.com/tomwhite/hadoop-book.git
Cloning into 'hadoop-book'...
remote: Enumerating objects: 4969, done.
remote: Total 4969 (delta 0), reused 0 (delta 0), pack-reused 4969 (from 1)
Receiving objects: 100% (4969/4969), 2.85 MiB | 6.78 MiB/s, done.
Resolving deltas: 100% (1945/1945), done.
ganajana@Anonymous:~$ hdfs dfs -put hadoop-book/input/ncdc/all/*/weatherdata
put: `.': No such file or directory: `hdfs://localhost:9000/user/ganajana'
ganajana@Anonymous:~$ hdfs dfs -ls /
Found 1 items
drwxr-xr-x   - ganajana supergroup          0 2025-05-26 16:27 /weatherdata
ganajana@Anonymous:~$ hdfs dfs -put hadoop-book/input/ncdc/all/*/weatherdata
put: `.': No such file or directory: `hdfs://localhost:9000/user/ganajana'
ganajana@Anonymous:~$ hdfs dfs -put hadoop-book/input/ncdc/all/* /weatherdata
ganajana@Anonymous:~$ nano map.py
ganajana@Anonymous:~$ chmod +x map.py
ganajana@Anonymous:~$ nano red.py
ganajana@Anonymous:~$ chmod +x red.py
ganajana@Anonymous:~$ hadoop jar $HADOOP_HOME/share/hadoop/tools/lib/hadoop-streaming-3.4.1.jar -input /weatherdata -output /weatherdata/out -mapper map.py
-reducer red.py
```

```
Max Temperature: 33.50
```

Experiment – 7

Q) For a given Text file, Create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words.

Screenshot:

for a given text file, Create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurences of words (Hadoop)

```
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
import java.io.IOException;
public class WordCountMapper extends Mapper<Object,
    Text,Text,IntWritable>
    private final static IntWritable one = new
                                    IntWritable(1);
    private Text word = new Text();
    @Override
    public void map(Object key, Text value,
                    Context context)
            throws IOException, Interrupt
        String[] words = value.toString().split
                                    ("\\s+");
        for(String w: words){
            word.set(w.toLowerCase().replaceAll
            ("[^a-zA-Z]", ""));
            context.write(word, one);
        }
    }
}
```

WordCountReducer.java

```
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
import java.io.IOException;

public class WordCounterReducer extends Reducer
<Text, IntWritable, Text, IntWritable> {

    private IntWritable result = new IntWritable
    ();

@Override
public void reduce(Text key, Iterable <Int-
                   Writable, Text, IntWritable>
{   values, Context context) throws IOException

    int sum=0

    for (IntWritable val: values) {
        sum = val.get();
    }

    result.set(sum);
    context.write(key, result);
}
```

Code & Output:

Top N Words Using MapReduce

TopN.java (Driver)

java

CopyEdit

```
package samples.topn;

import java.io.IOException;
import java.util.StringTokenizer;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.GenericOptionsParser;

public class TopN {
    public static void main(String[] args) throws Exception {
        Configuration conf = new Configuration();
        String[] otherArgs = (new GenericOptionsParser(conf, args)).getRemainingArgs();

        if (otherArgs.length != 2) {
            System.err.println("Usage: TopN <in> <out>");
```

```
        System.exit(2);
    }

    Job job = Job.getInstance(conf);
    job.setJobName("Top N");
    job.setJarByClass(TopN.class);
    job.setMapperClass(TopNMapper.class);
    job.setReducerClass(TopNReducer.class);
    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);

    FileInputFormat.addInputPath(job, new Path(otherArgs[0]));
    FileOutputFormat.setOutputPath(job, new Path(otherArgs[1]));

    System.exit(job.waitForCompletion(true) ? 0 : 1);
}

public static class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {
    private static final IntWritable one = new IntWritable(1);
    private Text word = new Text();
    private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";

    public void map(Object key, Text value, Mapper<Object, Text, Text, IntWritable>.Context context)
            throws IOException, InterruptedException {
        String cleanLine = value.toString().toLowerCase().replaceAll(this.tokens, " ");
        StringTokenizer itr = new StringTokenizer(cleanLine);

        while (itr.hasMoreTokens()) {
            this.word.set(itr.nextToken().trim());
            context.write(this.word, one);
        }
```

```
    }
  }
}
```

TopNCombiner.java

java

CopyEdit

```
package samples.topn;

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;

public class TopNCombiner extends Reducer<Text, IntWritable, Text, IntWritable> {
  public void reduce(Text key, Iterable<IntWritable> values,
                     Reducer<Text, IntWritable, Text, IntWritable>.Context context)
      throws IOException, InterruptedException {
    int sum = 0;
    for (IntWritable val : values)
      sum += val.get();
    context.write(key, new IntWritable(sum));
  }
}
```

TopNMapper.java

java

CopyEdit

```
package samples.topn;

import java.io.IOException;
```

```
import java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;

public class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {
   private static final IntWritable one = new IntWritable(1);
   private Text word = new Text();
   private String tokens = "[_|$#<>\\^=\\[\\]\\*/\\\\,;,.\\-:()?!\"']";

   public void map(Object key, Text value, Mapper<Object, Text, Text, IntWritable>.Context context)
         throws IOException, InterruptedException {
      String cleanLine = value.toString().toLowerCase().replaceAll(this.tokens, " ");
      StringTokenizer itr = new StringTokenizer(cleanLine);

      while (itr.hasMoreTokens()) {
         this.word.set(itr.nextToken().trim());
         context.write(this.word, one);
      }
   }
}
```

TopNReducer.java

java

CopyEdit

```
package samples.topn;

import java.io.IOException;
import java.util.HashMap;
import java.util.Map;
import org.apache.hadoop.io.IntWritable;
```

```
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
import utils.MiscUtils;

public class TopNReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
   private Map<Text, IntWritable> countMap = new HashMap<>();

   public void reduce(Text key, Iterable<IntWritable> values,
                      Reducer<Text, IntWritable, Text, IntWritable>.Context context)
         throws IOException, InterruptedException {
      int sum = 0;
      for (IntWritable val : values)
         sum += val.get();
      this.countMap.put(new Text(key), new IntWritable(sum));
   }

   protected void cleanup(Reducer<Text, IntWritable, Text, IntWritable>.Context context)
         throws IOException, InterruptedException {
      Map<Text, IntWritable> sortedMap = MiscUtils.sortByValues(this.countMap);
      int counter = 0;
      for (Text key : sortedMap.keySet()) {
         if (counter++ == 20)
            break;
         context.write(key, sortedMap.get(key));
      }
   }
}
```

```
C:\hadoop-3.3.0\sbin>jps
11072 DataNode
20528 Jps
5620 ResourceManager
15532 NodeManager
6140 NameNode

C:\hadoop-3.3.0\sbin>hdfs dfs -mkdir /input_dir
```

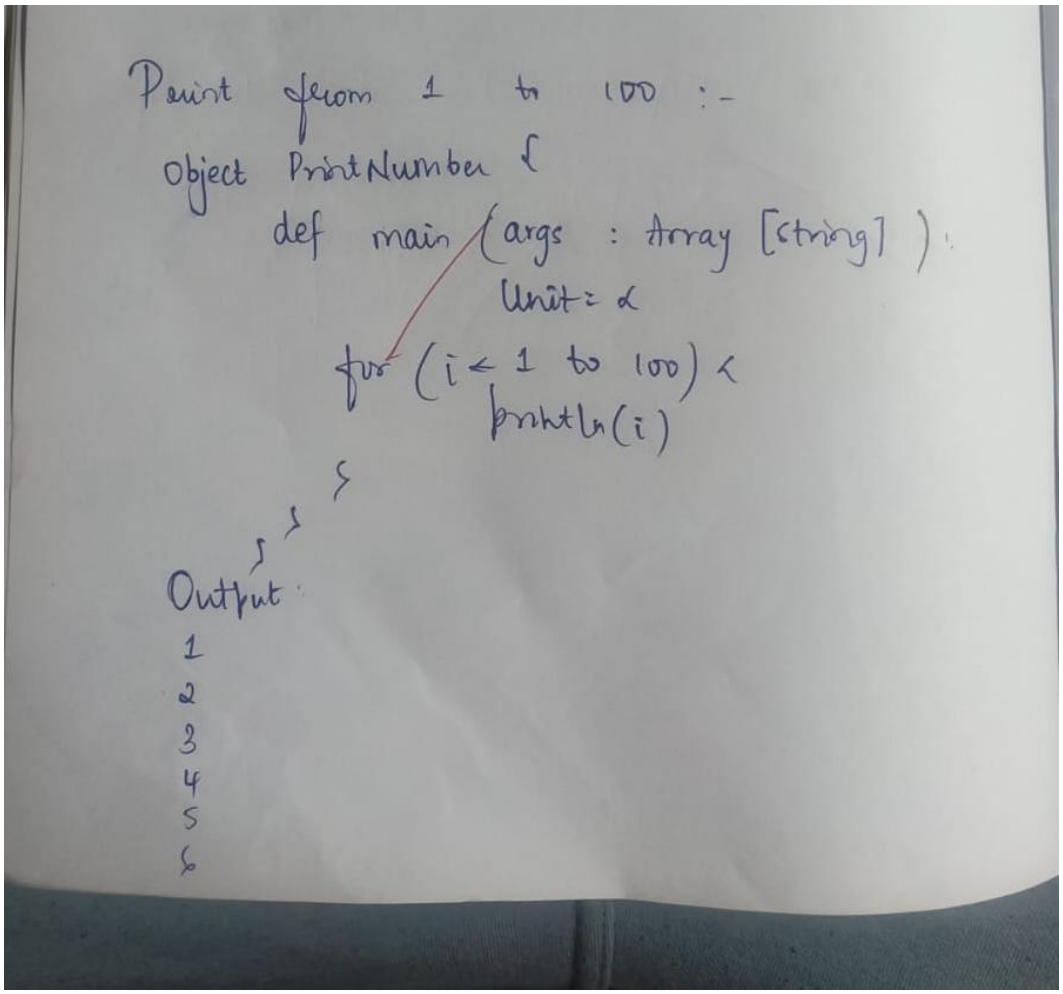
```
C:\hadoop-3.3.0\sbin>hadoop jar C:\sort.jar samples.topn.TopN /input_dir/input.txt /output_dir
2021-05-08 19:54:54,582 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-08 19:54:55,291 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1620483374279_0001
2021-05-08 19:54:55,821 INFO input.FileInputFormat: Total input files to process : 1
2021-05-08 19:54:56,261 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-08 19:54:56,552 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1620483374279_0001
2021-05-08 19:54:56,552 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-08 19:54:56,843 INFO conf.Configuration: resource-types.xml not found
2021-05-08 19:54:56,843 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-08 19:54:57,387 INFO impl.YarnClientImpl: Submitted application application_1620483374279_0001
2021-05-08 19:54:57,507 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG329ESD:8088/proxy/application_1620483374279_0001/
2021-05-08 19:54:57,508 INFO mapreduce.Job: Running job: job_1620483374279_0001
2021-05-08 19:55:13,792 INFO mapreduce.Job: Job job_1620483374279_0001 running in uber mode : false
2021-05-08 19:55:13,794 INFO mapreduce.Job:  map 0% reduce 0%
2021-05-08 19:55:20,020 INFO mapreduce.Job:  map 100% reduce 0%
2021-05-08 19:55:27,116 INFO mapreduce.Job:  map 100% reduce 100%
2021-05-08 19:55:33,199 INFO mapreduce.Job: Job job_1620483374279_0001 completed successfully
2021-05-08 19:55:33,334 INFO mapreduce.Job: Counters: 54
        File System Counters
                FILE: Number of bytes read=65
                FILE: Number of bytes written=530397
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=142
                HDFS: Number of bytes written=31
                HDFS: Number of read operations=8
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=2
                HDFS: Number of bytes read erasure-coded=0
```

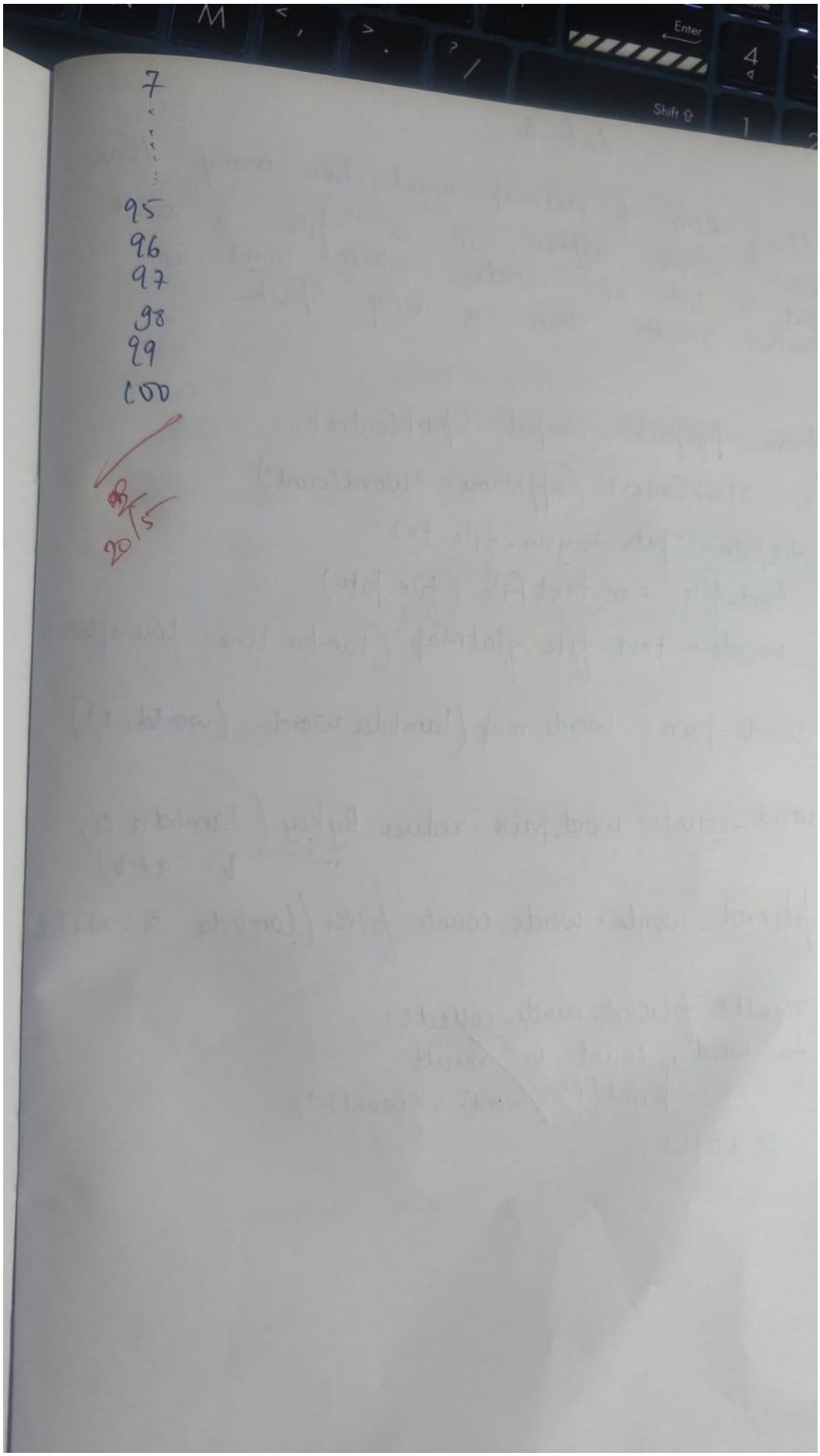
```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /output_dir/*
hello   2
hadoop  1
world   1
bye     1

C:\hadoop-3.3.0\sbin>
```

Experiment – 8

Q) Write a Scala program to print numbers from 1 to 100 using for loop.

Screenshot:

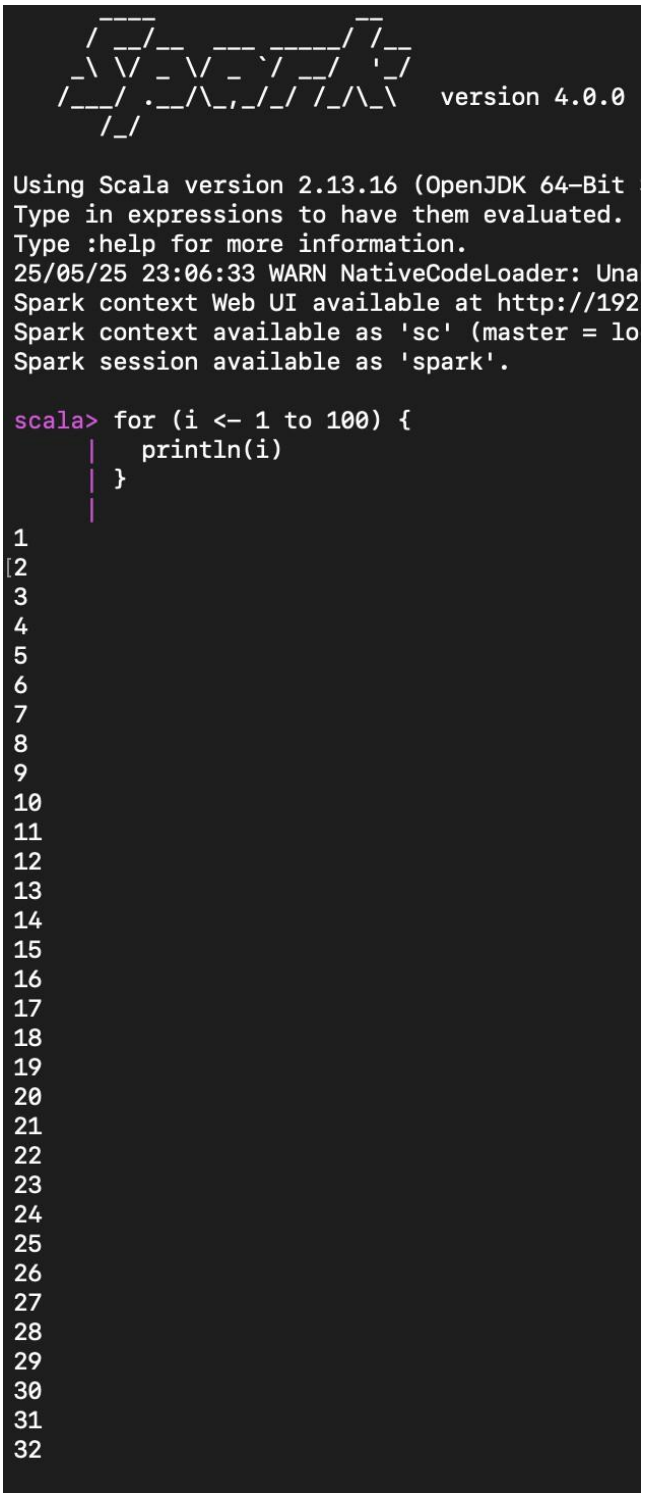



7
95
96
97
98
99
100
88/5
20

Code:

```
for (i <- 1 to 100) {
  println(i)
}
```

Output:(NEXT PAGE)


____ __
/ __/__ ___ _____/ /__
_\ \/ _ \/ _ `/ __/ '_/
/___/ .__/_,_/_/ /_/_\ version 4.0.0
/_/
Using Scala version 2.13.16 (OpenJDK 64-Bit
Type in expressions to have them evaluated.
Type :help for more information.
25/05/25 23:06:33 WARN NativeCodeLoader: Una
Spark context Web UI available at http://192
Spark context available as 'sc' (master = lo
Spark session available as 'spark'.
scala> for (i <- 1 to 100) {
| println(i)
| }
|
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32

```
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100



scala>
```

Experiment – 9

Q) Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark.

Screenshot:

Lab - 8

Using RDD & FlatMap count how many times each word appears in a file & write out a list of words whose count is strictly greater than 4 using Spark.

```
from pyspark import SparkContext
sc = SparkContext (appName = "WordCount")
file_path = "path_to_your_file.txt"
text_file = sc.textFile (file_path)
words = text_file.flatMap (lambda line: line.split())
words_pairs = words.map (lambda word: (word, 1))
word_counts = word_pairs.reduceByKey ( lambda a,
                                       b: a+b)
filtered_words = words_counts.filter (lambda x: x[1]>4)
result = filtered_words.collect()
for word, count in result:
        print (f" {word} : {count} ")
sc.stop().
```

Code:

```
val text = sc.textFile("file:///Users//Desktop/word.txt")

val words = text.flatMap(_.split("\\W+"))

val cleanedWords = words.map(_.toLowerCase).filter(_.nonEmpty)

val wordPairs = cleanedWords.map((_, 1))

val wordCounts = wordPairs.reduceByKey(_ + _)

val frequentWords = wordCounts.filter(_._2 > 4)

val wordsOnly = frequentWords.map(_._1)

wordsOnly.collect().foreach(println)
```

Input Word.txt file :

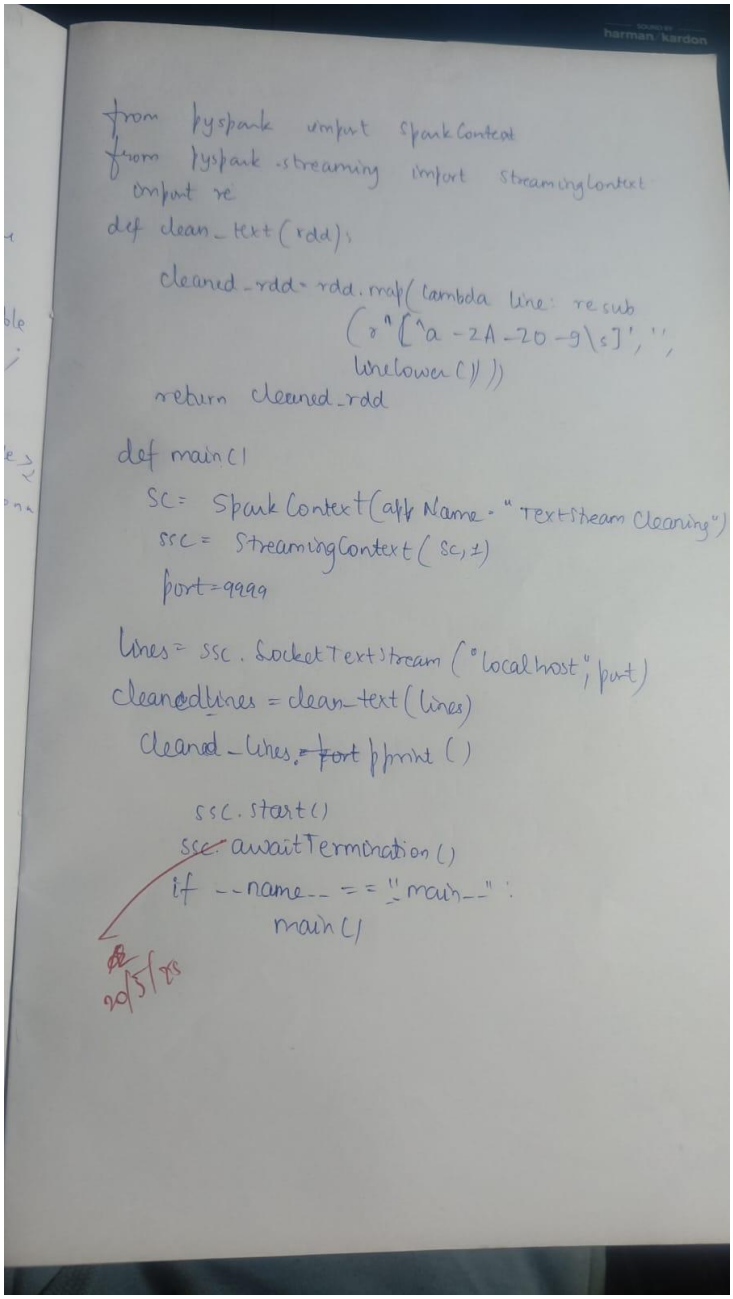
```
Apple, Apple, apple, APPLE, apple. This is an apple.
Banana orange grape spark.
Data data data data data.
Hello world. Hello Spark. Hello Scala. Hello again. Hello.
Another word, another line.
```

Output:

Experiment 10:

Q)Write a simple streaming program in Spark to receive text data streams on a particular port, perform basic text cleaning (like white space removal, stop words removal, lemmatization, etc.), and print the cleaned text on the screen. (Open Ended Question)

Screenshot:



Output:

```
Requirement already satisfied: nltk in /usr/local/lib/python3.11/dist-packages (3.9.1)
Requirement already satisfied: click in /usr/local/lib/python3.11/dist-packages (from nltk) (8.2.0)
Requirement already satisfied: joblib in /usr/local/lib/python3.11/dist-packages (from nltk) (1.5.0)
Requirement already satisfied: regex>=2021.8.3 in /usr/local/lib/python3.11/dist-packages (from nltk) (2024.11.6)
Requirement already satisfied: tqdm in /usr/local/lib/python3.11/dist-packages (from nltk) (4.67.1)
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
[nltk_data] Downloading package wordnet to /root/nltk_data...
+------+
|word  |
+------+
|hello |
|hate  |
|hate  |
|love  |
|dont  |
|want  |
|cant  |
|put   |
|nobody|
|else  |
+------+
```