VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

Big Data Analytics (23CS6PCBDA)

Submitted by:

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Under the Guidance of
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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
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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**” carried out by **Nikhilesh C (1BM22CS181),** 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 2024. The Lab report has been approved as it satisfies the academic requirements in respect of **Big Data Analytics – (23CS6PCBDA)** work prescribed for the said degree.

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Course Outcomes

CO1: Apply the concepts of NoSQL, Hadoop, Spark for a given task

CO2: Analyze data analytic techniques for a given problem.

CO3: Conduct experiments using data analytics mechanisms for a given problem.

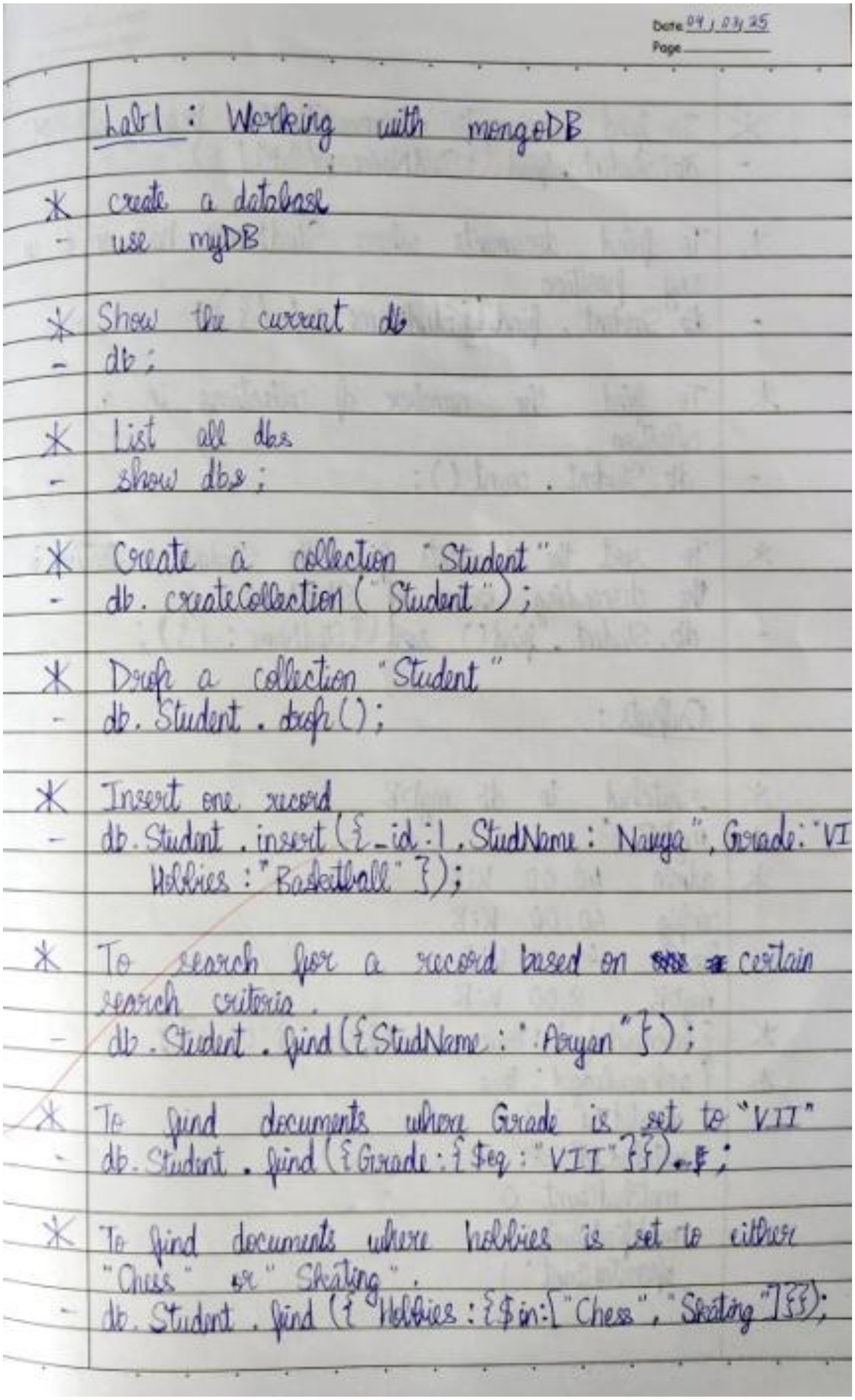
1. Experiments

Experiment - 1

Question:

Perform the following DB operations using Cassandra.

- Create a keyspace by name Employee
- Create a column family by name, Employee-Info with attributes Emp_Id Primary Key, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name
- Insert the values into the table in batch
- Update Employee name and Department of Emp-Id 121
- Sort the details of Employee records based on salary
- Alter the schema of the table Employee_Info to add a column Projects which stores a
- set of Projects done by the corresponding Employee.
- Update the altered table to add project names.
- Create a TTL of 15 seconds to display the values of Employees.



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Lab1 : Working with mongoDB

* create a database
- use myDB

* Show the current db
- db;

* List all dbs
- show dbs;

* Create a collection "Student"
- db. createCollection ("Student");

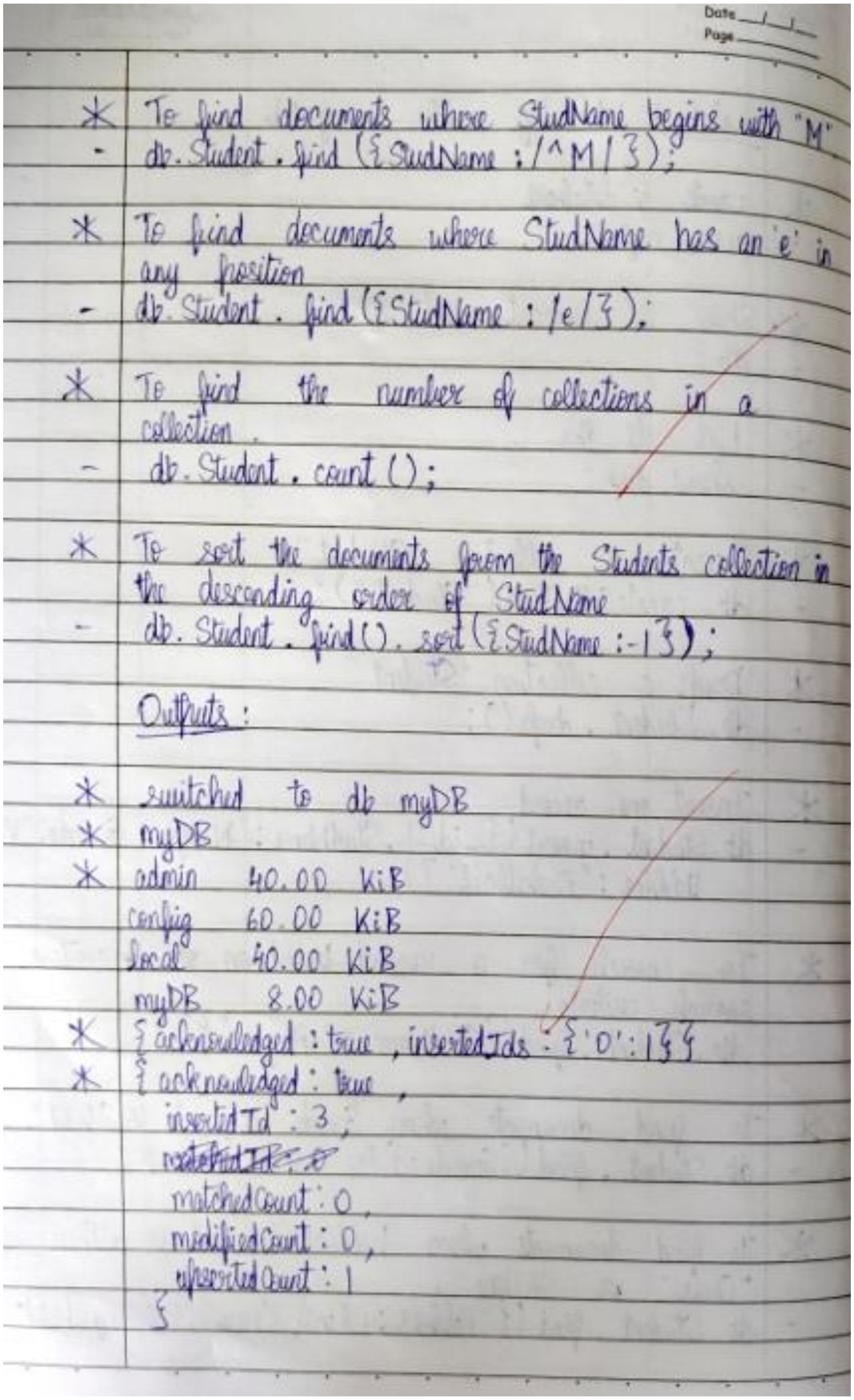
* Drop a collection "Student"
- db. Student . drop();

* Insert one record
- db. Student . insert ({_id:1, StudName : "Navya", Grade: "VI
  Hobbies : "Basketball" });

* To search for a record based on certain search criteria.
- db. Student . find ({StudName : "Aryan"});

* To find documents where Grade is set to "VII"
- db. Student . find ({Grade : {$eq : "VII"}});

* To find documents where hobbies is set to either "Chess" or "Skating".
- db. Student . find ({Hobbies : {$in: ["Chess", "Skating"]}});



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* To find documents where StudName begins with "M"

```
- db.Student.find({StudName:/^M/});
```

* To find documents where StudName has an 'e' in any position

```
- db.Student.find({StudName:/e/});
```

* To find the number of collections in a collection.

```
- db.Student.count();
```

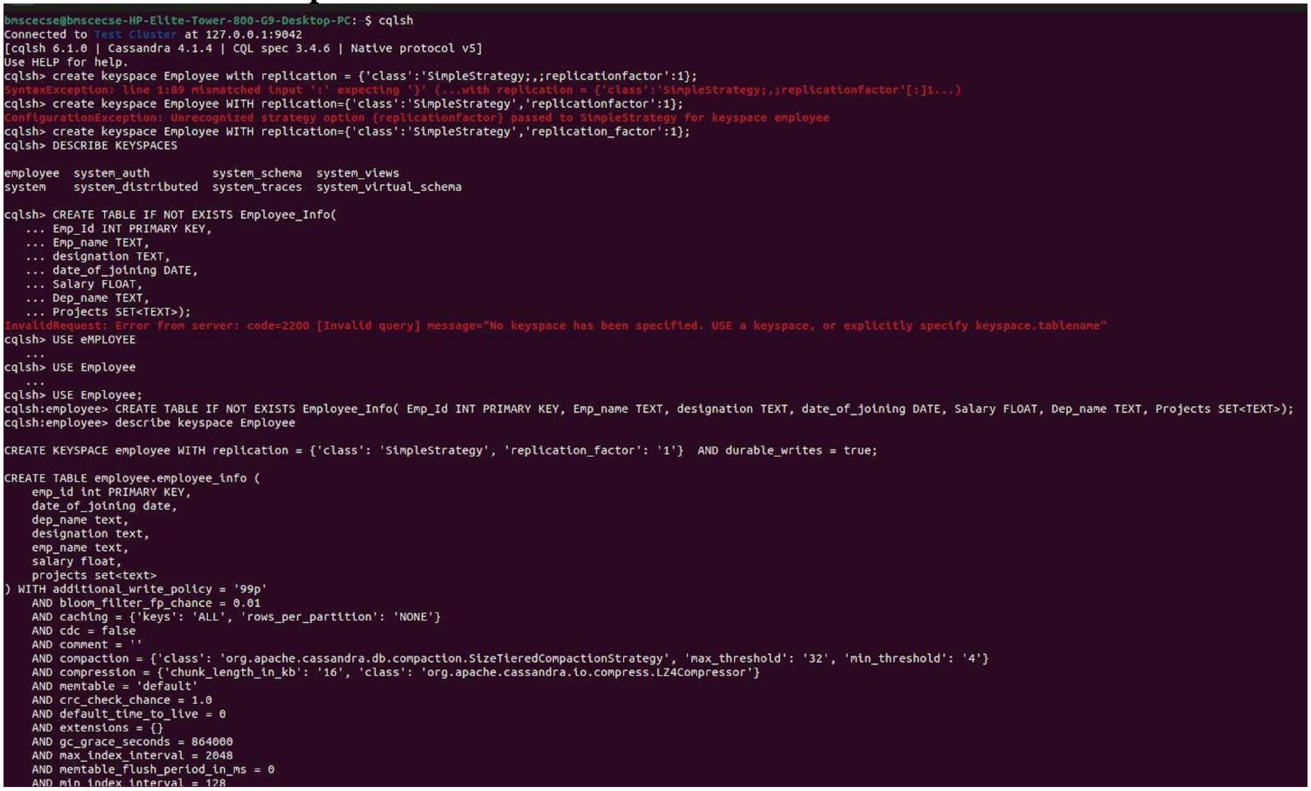
* To sort the documents from the Students collection in the descending order of StudName

```
- db.Student.find().sort({StudName:-1});
```

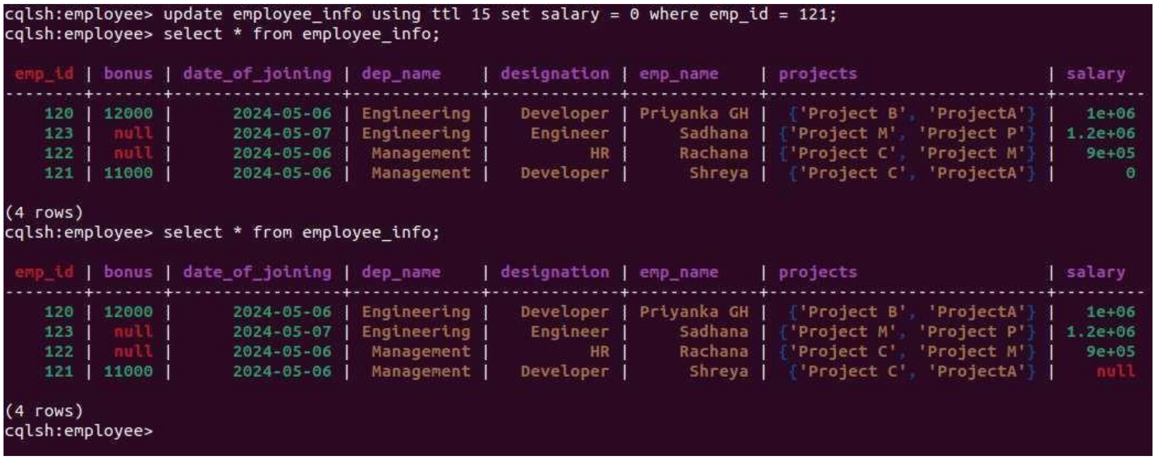
Outputs:

```
* switched to db myDB
* myDB
* admin    40.00 KiB
  config   60.00 KiB
  local    40.00 KiB
  myDB      8.00 KiB
* {acknowledged : true , insertedIds : {'0':1}}
* {acknowledged : true ,
    insertedId : 3 ,
    ~~matchedId : 0~~
    matchedCount : 0 ,
    modifiedCount : 0 ,
    upsertedCount : 1
  }
```

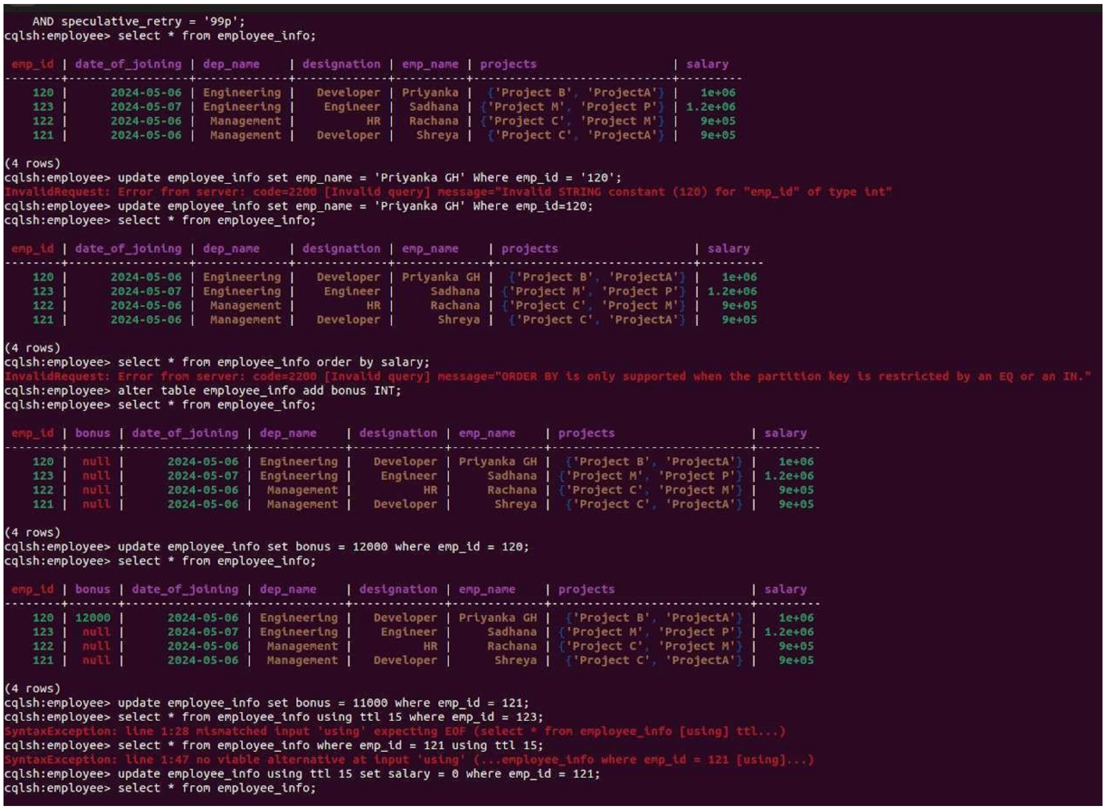
1.1.2 Code with Output:



```
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>
```



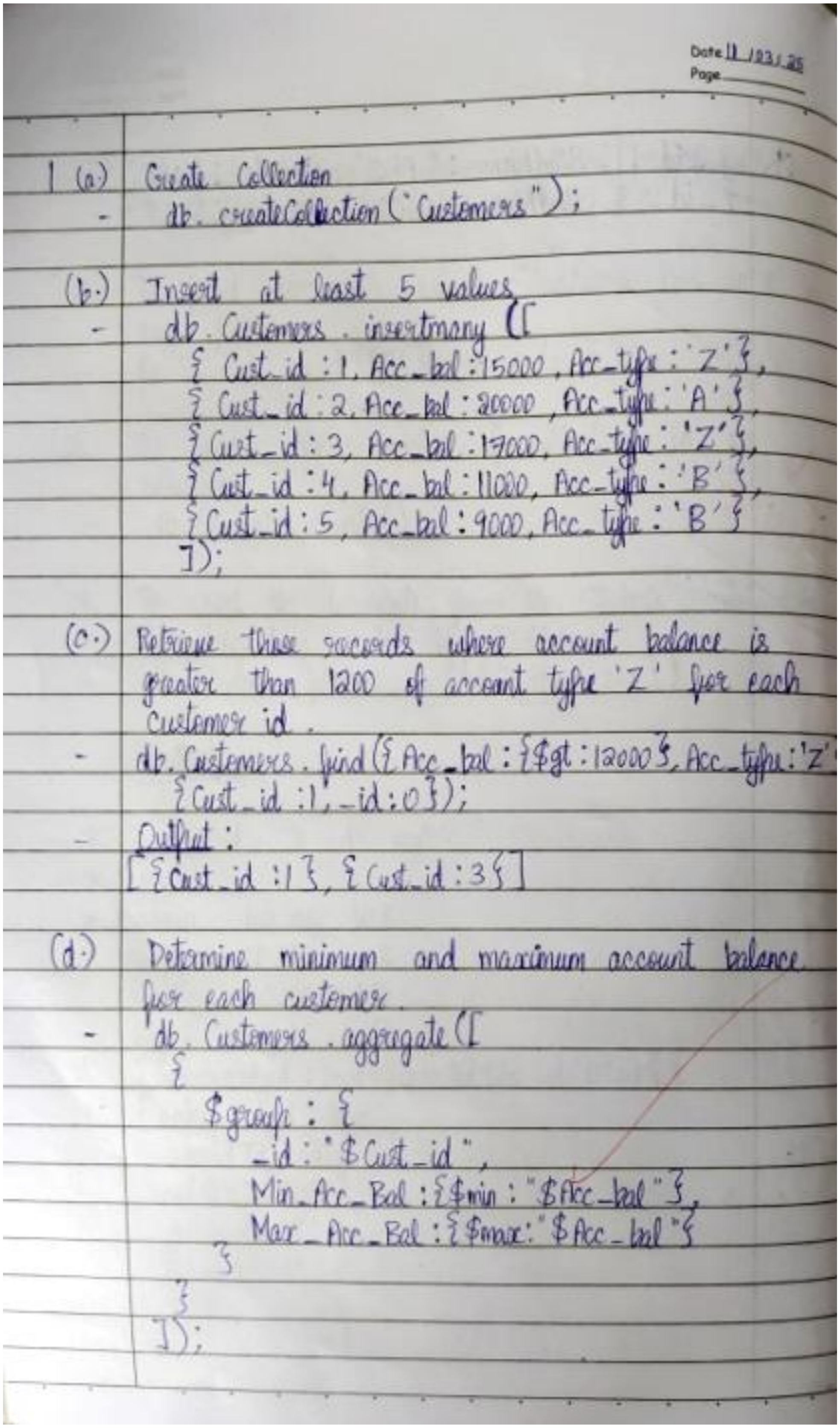
```
    AND speculative_retry = '99p';
cqlsh:employee> select * from employee_info;

 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;
```

1.2 Experiment - 2

1.2.1 Question:

Perform the following DB operations using Cassandra:

- Create a keyspace by name Library
- 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
- Insert the values into the table in batch
- Display the details of the table created and increase the value of the counter
- Write a query to show that a student with id 112 has taken a book “BDA” 2 times.
- Export the created column to a csv file
- Import a given csv dataset from local file system into Cassandra column family**.**



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1 (a) Create Collection

```
- db. createCollection ("Customers");
```

(b.) Insert at least 5 values

```
- db. Customers . insertmany ([
    { Cust_id : 1, Acc_bal : 15000 , Acc_type : 'Z' },
    { Cust_id : 2, Acc_bal : 20000 , Acc_type : 'A' },
    { Cust_id : 3, Acc_bal : 17000, Acc_type : 'Z' },
    { Cust_id : 4, Acc_bal : 11000, Acc_type : 'B' },
    { Cust_id : 5, Acc_bal : 9000, Acc_type : 'B' }
  ]);
```

(c.) Retrieve those records where account balance is greater than 1200 of account type 'Z' for each customer id.

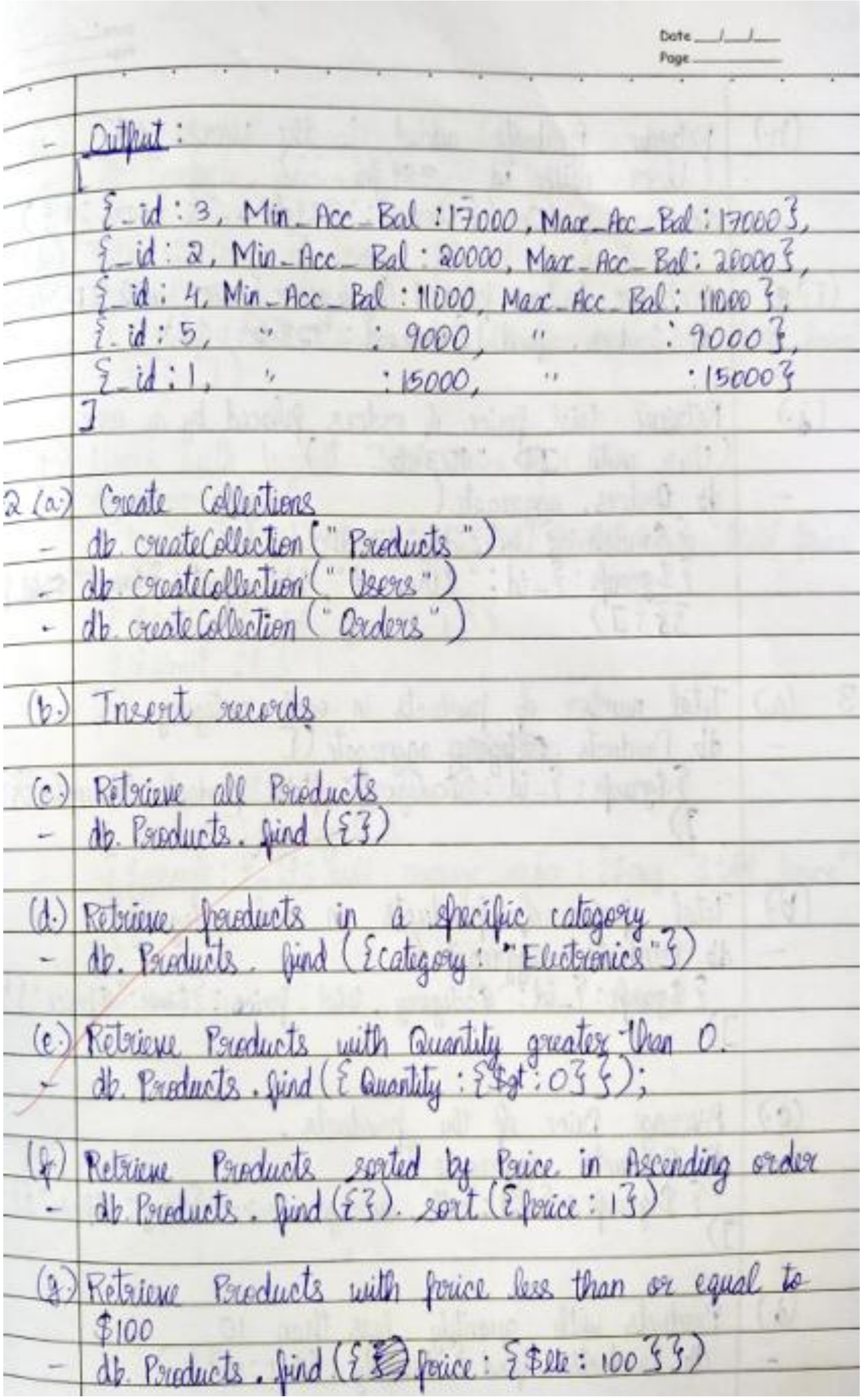
```
- db. Customers . find({ Acc_bal : {$gt : 12000 }, Acc_type : 'Z'
    {Cust_id : 1, _id : 0 });
```

- Output :

```
[ {Cust_id : 1 }, { Cust_id : 3 } ]
```

(d.) Determine minimum and maximum account balance for each customer.

```
- db. Customers . aggregate ([
    {
      $group : {
         _id : "$Cust_id",
         Min_Acc_Bal : {$min : "$Acc_bal" },
         Max_Acc_Bal : { $max: "$Acc_bal" }
      }
    }
  ]);
```



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- Output :

```
[
 {_id : 3, Min_Acc_Bal : 17000, Max_Acc_Bal : 17000},
 {_id : 2, Min_Acc_Bal : 20000, Max_Acc_Bal : 20000},
 {_id : 4, Min_Acc_Bal : 11000, Max_Acc_Bal : 11000},
 {_id : 5,     "      : 9000,     "      : 9000},
 {_id : 1,     "      : 15000,    "      : 15000}
]
```

2 (a.) Create Collections

- db.createCollection("Products")
- db.createCollection("Users")
- db.createCollection("Orders")

(b.) Insert records

(c.) Retrieve all Products

- db.Products.find({})

(d.) Retrieve products in a specific category

- db.Products.find({category: "Electronics"})

(e.) Retrieve Products with Quantity greater than 0.

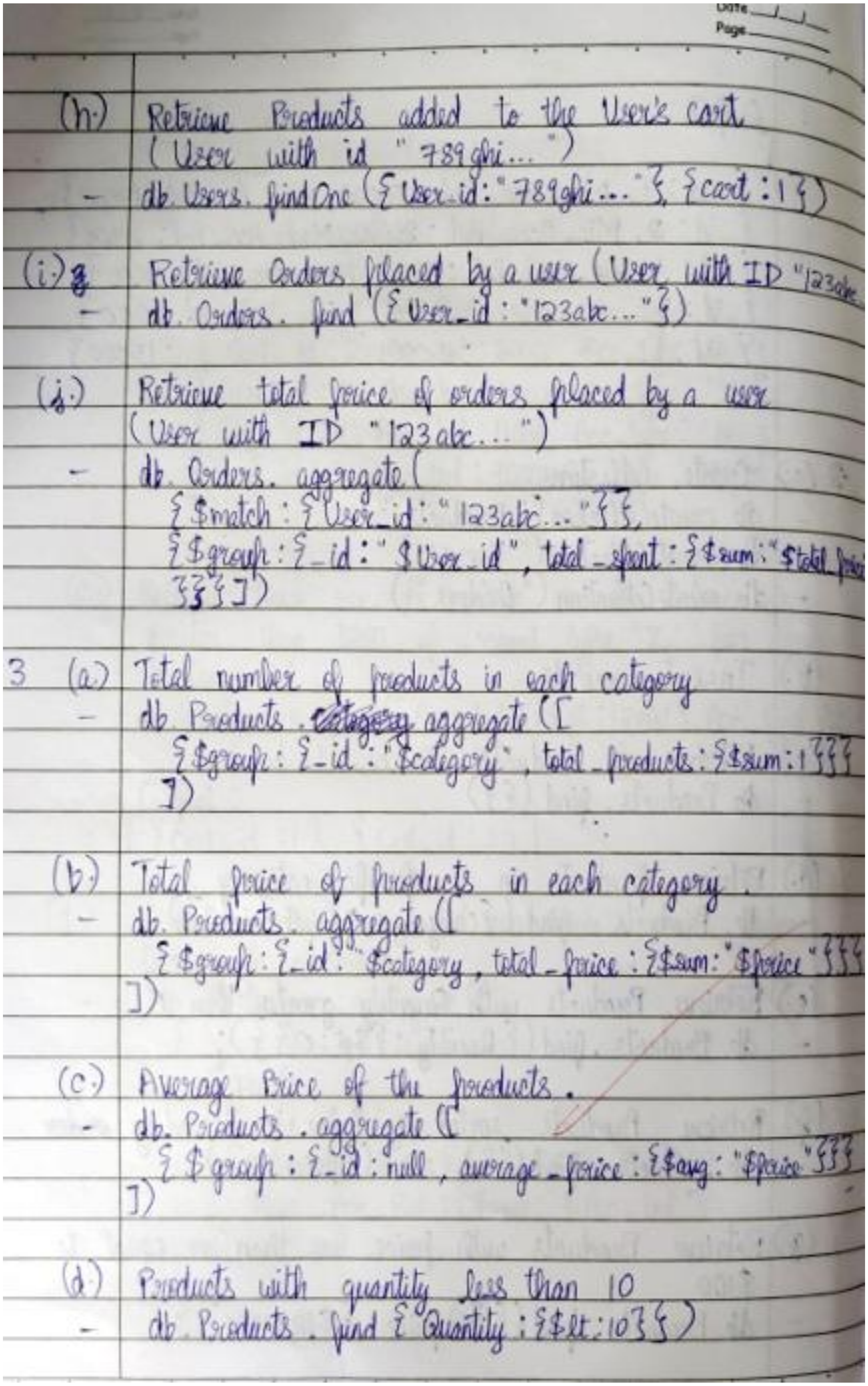
- db.Products.find({Quantity : {$gt: 0}});

(f.) Retrieve Products sorted by Price in Ascending order

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

(g.) Retrieve Products with price less than or equal to $100

- db.Products.find({ price : {$lte : 100}})



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(h.) Retrieve Products added to the User's cart (User with id "789ghi...")

```
- db.Users.findOne({User_id:"789ghi..."}, {cart:1})
```

(i.) Retrieve Orders placed by a user (User with ID "123abc

```
- db.Orders.find({User_id:"123abc..."})
```

(j.) Retrieve total price of orders placed by a user (User with ID "123abc...")

```
- db.Orders.aggregate(
    {$match:{User_id:"123abc..."}},
    {$group:{_id:"$User_id", total_spent:{$sum:"$total_pri
    }}}])
```

3 (a.) Total number of products in each category

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

(b.) Total price of products in each category.

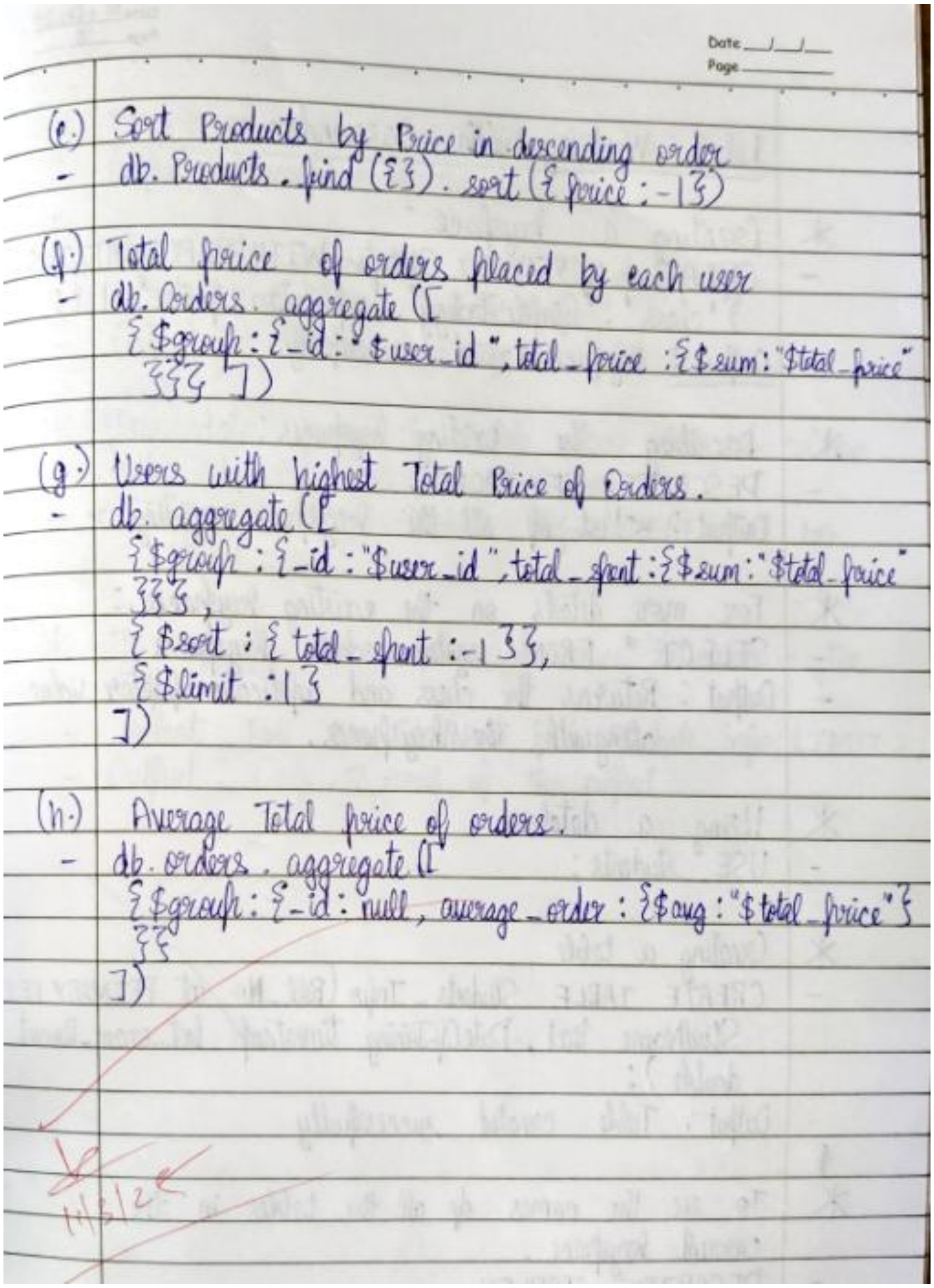
```
- db.Products.aggregate([
    {$group:{_id:"$category, total_price:{$sum:"$price"}}}
  ])
```

(c.) Average Price of the products.

```
- db.Products.aggregate([
    {$group:{_id:null, average_price:{$avg:"$price"}}}
  ])
```

(d.) Products with quantity less than 10

```
- db.Products.find{Quantity:{$lt:10}})
```



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(e.) Sort Products by Price in descending order

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

(f.) Total price of orders placed by each user

```
- db. Orders . aggregate ([
   { $group : {_id : "$user_id", total_price : {$sum: "$total_price"
   }}} ])
```

(g.) Users with highest Total Price of Orders.

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

(h.) Average Total price of orders.

```
- db. orders . aggregate ([
   {$group : {_id : null, average_order : {$avg : "$total_price"}
   }}
   ])
```

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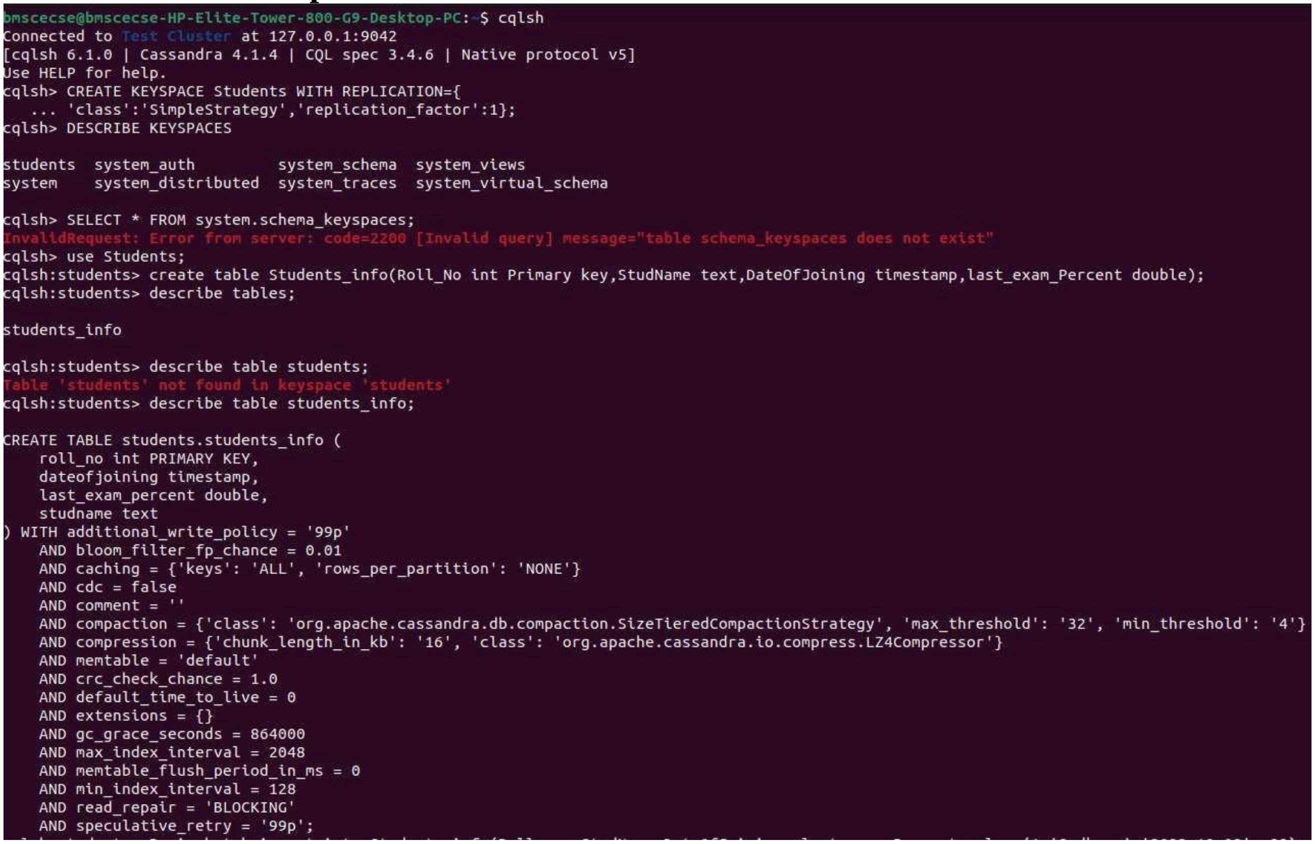
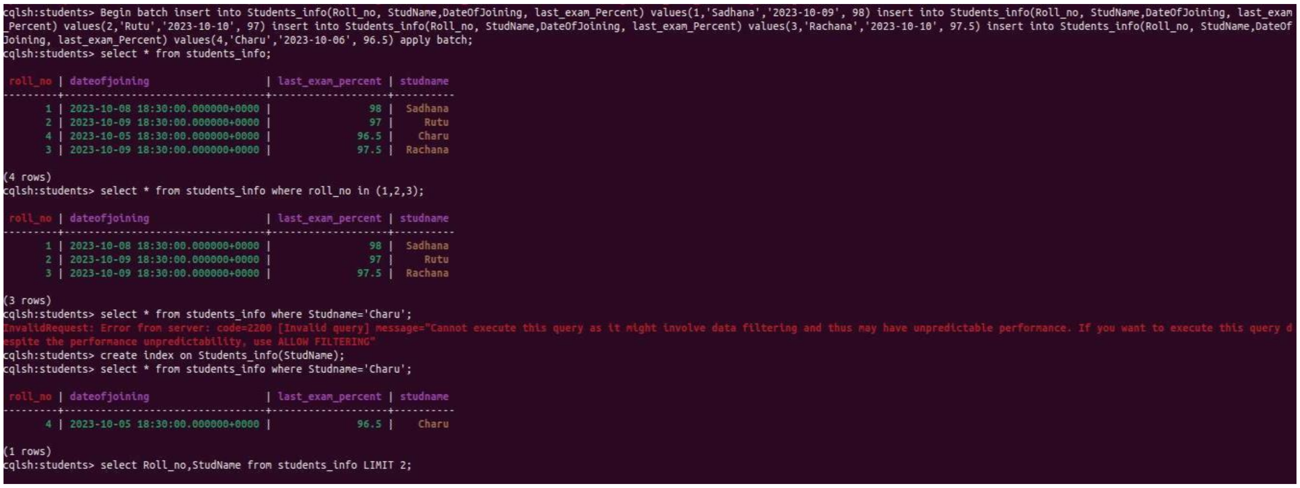
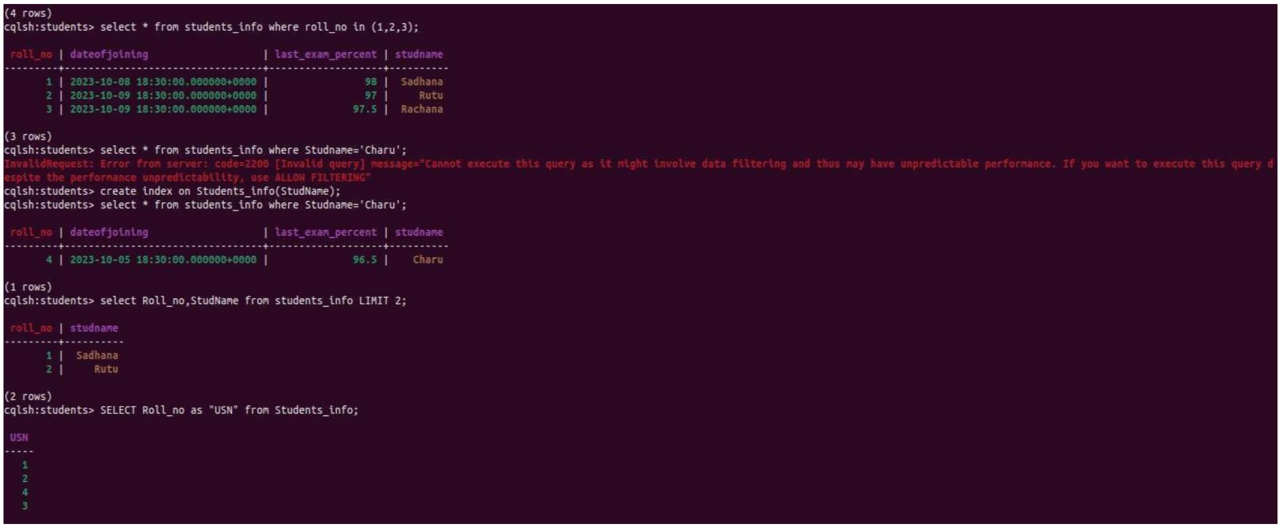
1.2.2 Code with Output:



```
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;
```

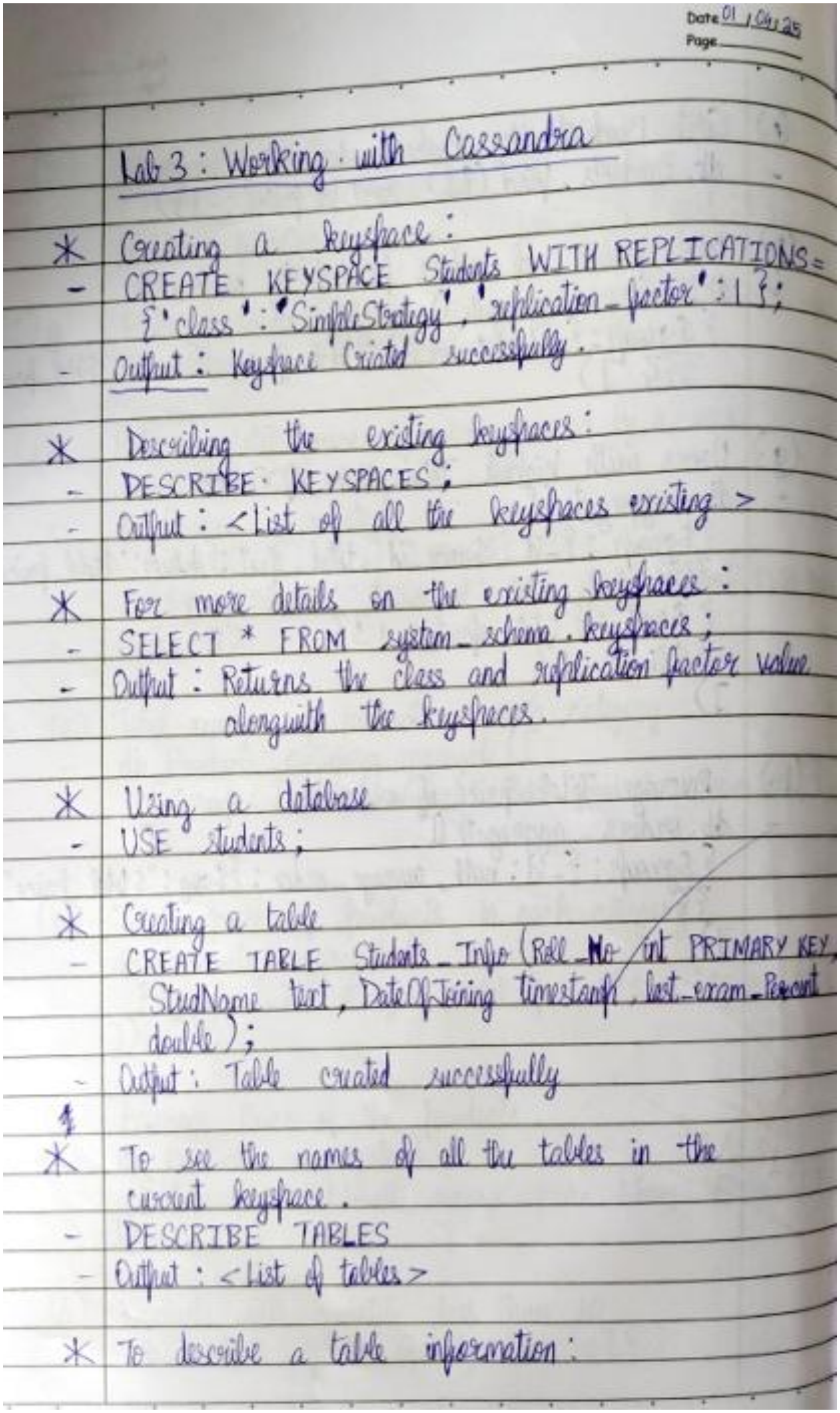


```
(4 rows)
cqlsh:students> select * from students_info where roll_no in (1,2,3);

 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
```

1.3 Experiment - 3

1.3.1 Question:

MongoDB - CRUD Demonstration.



Date 01 / 04 / 25
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Lab 3 : Working with Cassandra

* Creating a keyspace :
- CREATE KEYSPACE Students WITH REPLICATIONS = {'class':'SimpleStrategy', 'replication_factor': 1 };
- Output : Keyspace Criated successfully.

* Describing the existing keyspaces :
- DESCRIBE KEYSPACES ;
- Output : <list of all the keyspaces existing >

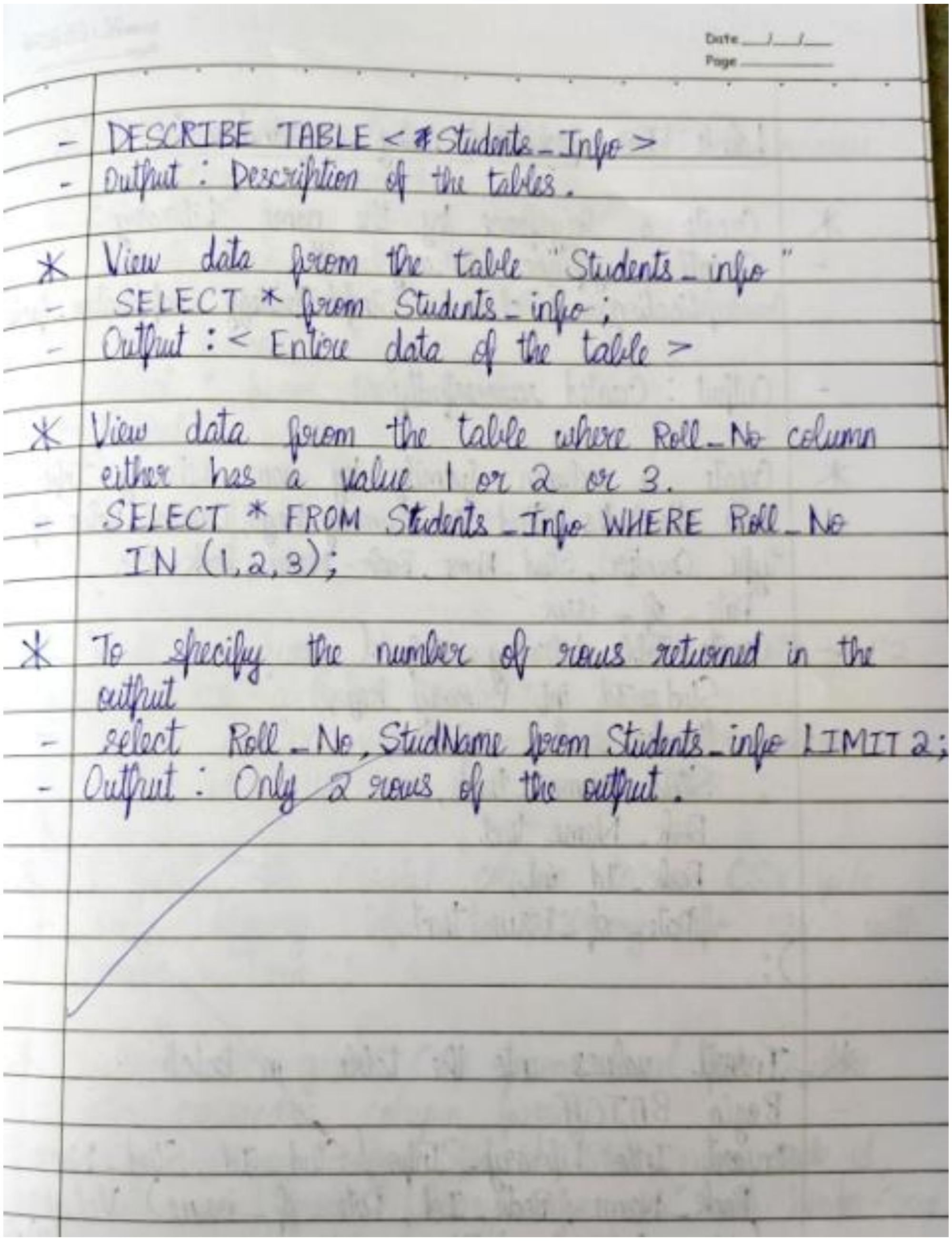
* For more details on the existing keyspaces :
- SELECT * FROM system_schema . keyspaces ;
- Output : Returns the class and replication factor value alongwith the keyspaces.

* Using a database
- USE students ;

* Creating a table
- CREATE TABLE Students_Info (Roll_No int PRIMARY KEY, StudName text, DateOfJoining timestamp, last_exam_Percent double);
- Output : Table created successfully

* To see the names of all the tables in the current keyspace.
- DESCRIBE TABLES
- Output : <List of tables >

* To describe a table information :



Date __/__/__
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- DESCRIBE TABLE < ~~*~~Students_Info >
- Output : Description of the tables.

* View data from the table "Students_info"
- SELECT * from Students_info;
- Output : < Entire data of the table >

* View data from the table where Roll_No column either has a value 1 or 2 or 3.
- SELECT * FROM Students_Info WHERE Roll_No IN (1,2,3);

* To specify the number of rows returned in the output
- select Roll_No, StudName from Students_info LIMIT 2;
- Output : Only 2 rows of the output.

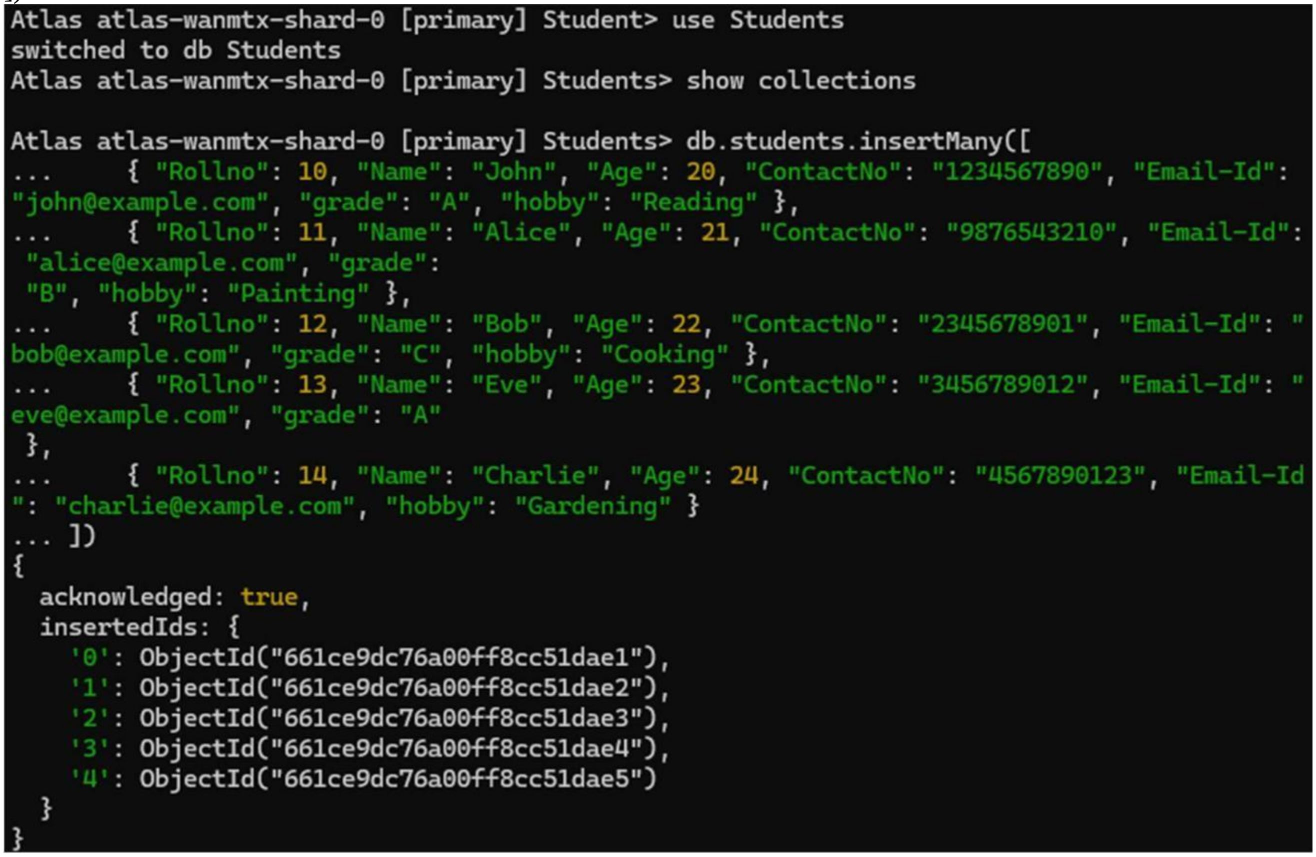
1.3.2 Code with Output:

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" }
])
```

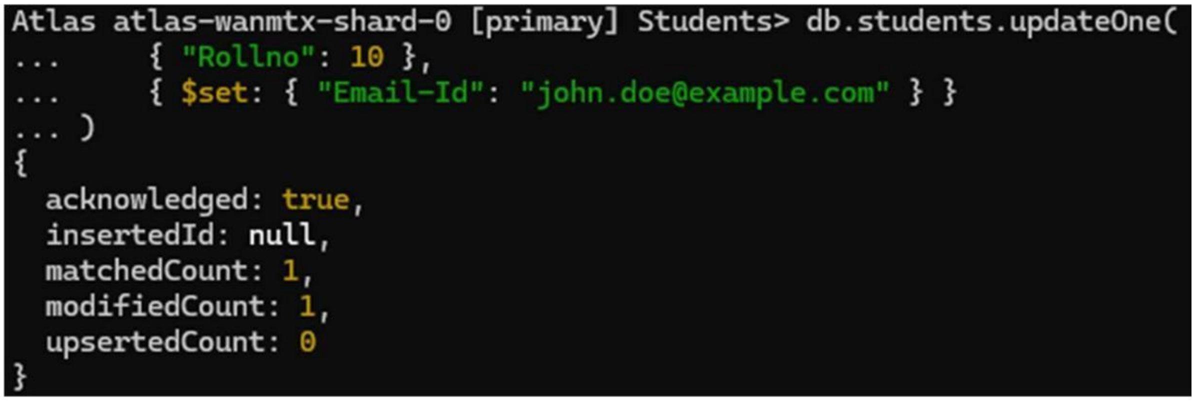


```
Atlas atlas-wanmtx-shard-0 [primary] Student> use Students
switched to db Students
Atlas atlas-wanmtx-shard-0 [primary] Students> show collections

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.

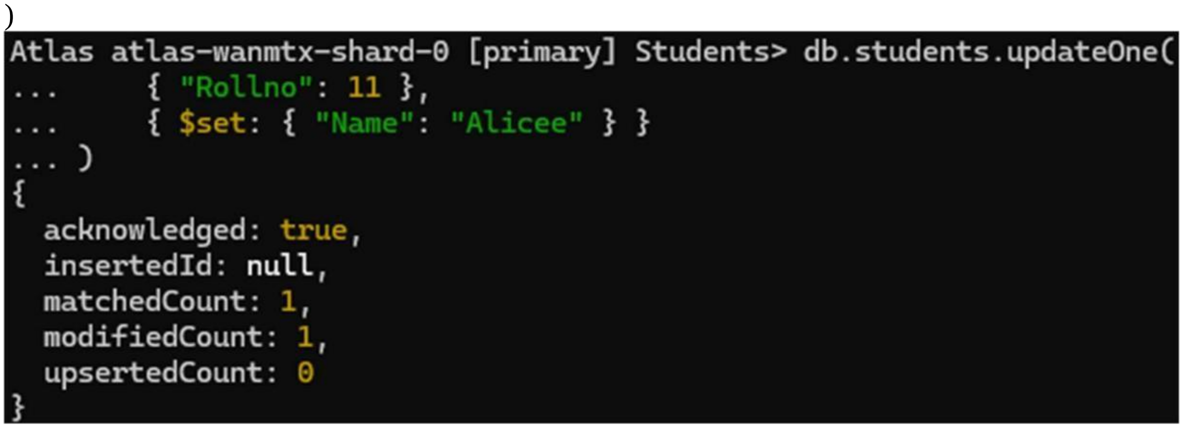
```
db.students.updateOne(
   { "Rollno": 10 },
   { $set: { "Email-Id": "john.doe@example.com" } }
)
```



```
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

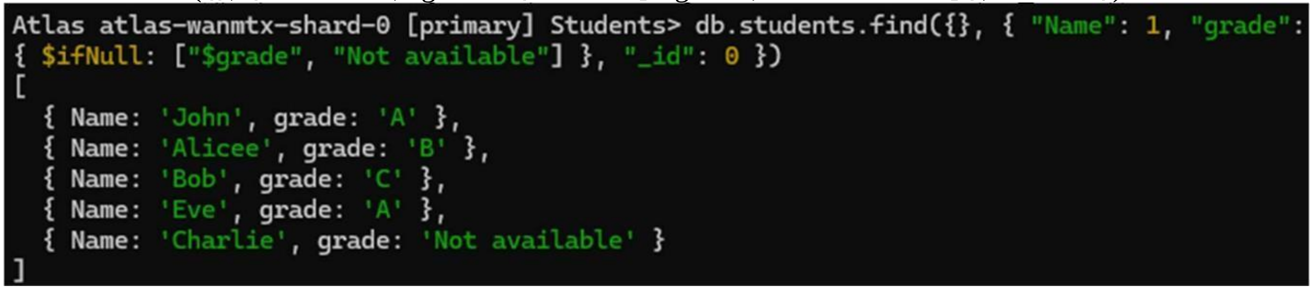
```
db.students.updateOne(
   { "Rollno": 11 },
   { $set: { "Name": "Alicee" } }
)
```



```
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.

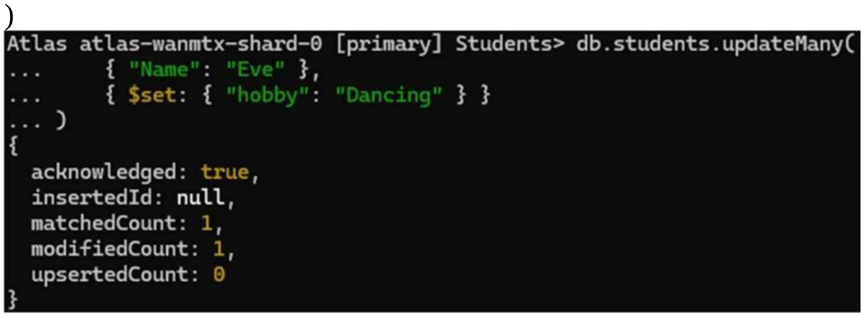
```
db.students.find({}, { "Name": 1, "grade": { $ifNull: ["$grade", "Not available"] }, "_id": 0 })
```



```
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

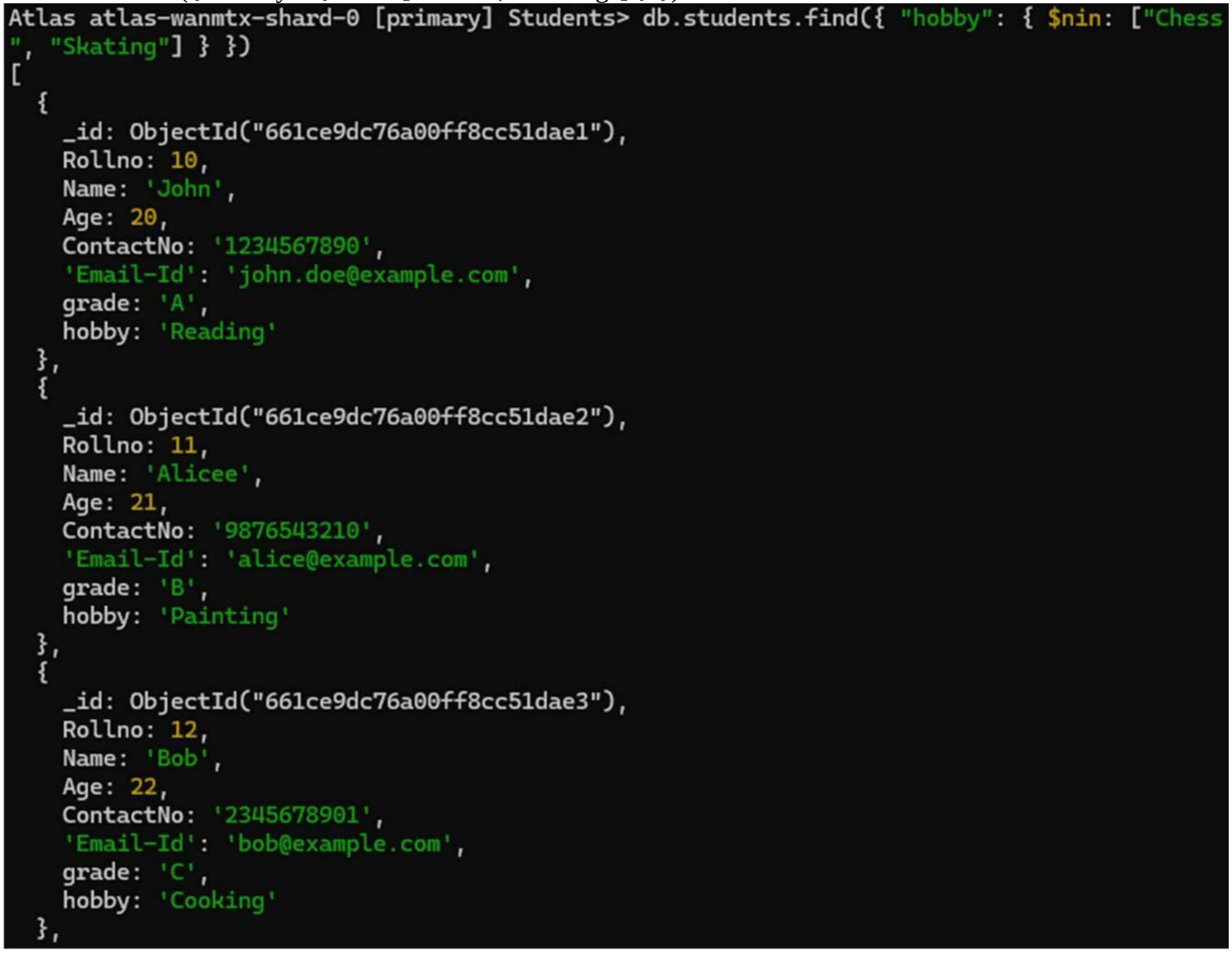
```
db.students.updateMany(
   { "Name": "Eve" },
   { $set: { "hobby": "Dancing" } }
)
```



```
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

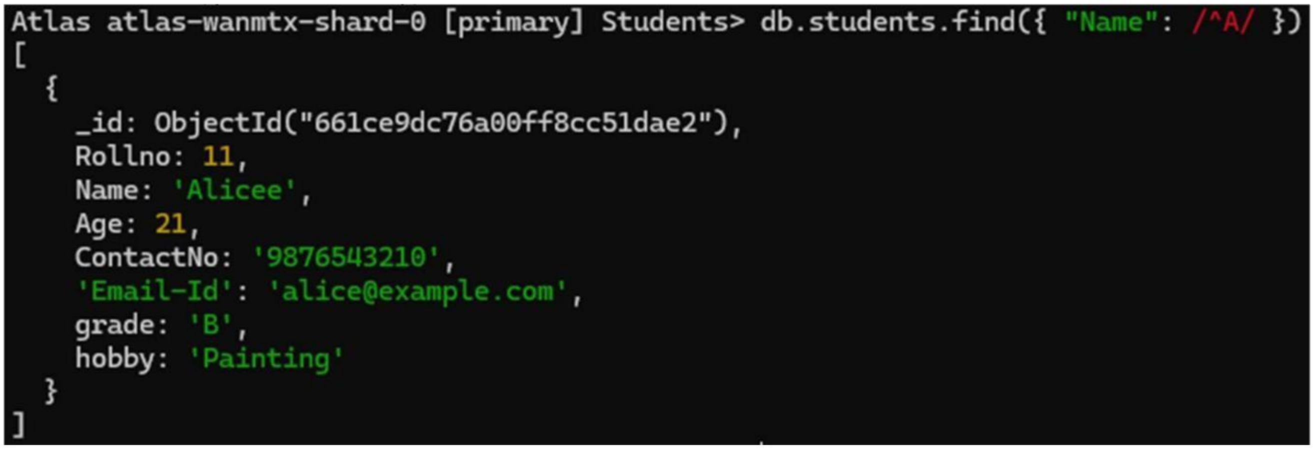
db.students.find({ "hobby": { $nin: ["Chess", "Skating"] } })



```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.find({ "hobby": { $nin: ["Chess
", "Skating"] } })
[
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae1"),
    Rollno: 10,
    Name: 'John',
    Age: 20,
    ContactNo: '1234567890',
    'Email-Id': 'john.doe@example.com',
    grade: 'A',
    hobby: 'Reading'
  },
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae2"),
    Rollno: 11,
    Name: 'Alicee',
    Age: 21,
    ContactNo: '9876543210',
    'Email-Id': 'alice@example.com',
    grade: 'B',
    hobby: 'Painting'
  },
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae3"),
    Rollno: 12,
    Name: 'Bob',
    Age: 22,
    ContactNo: '2345678901',
    'Email-Id': 'bob@example.com',
    grade: 'C',
    hobby: 'Cooking'
  },
```

8. Find documents whose name begins with A

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

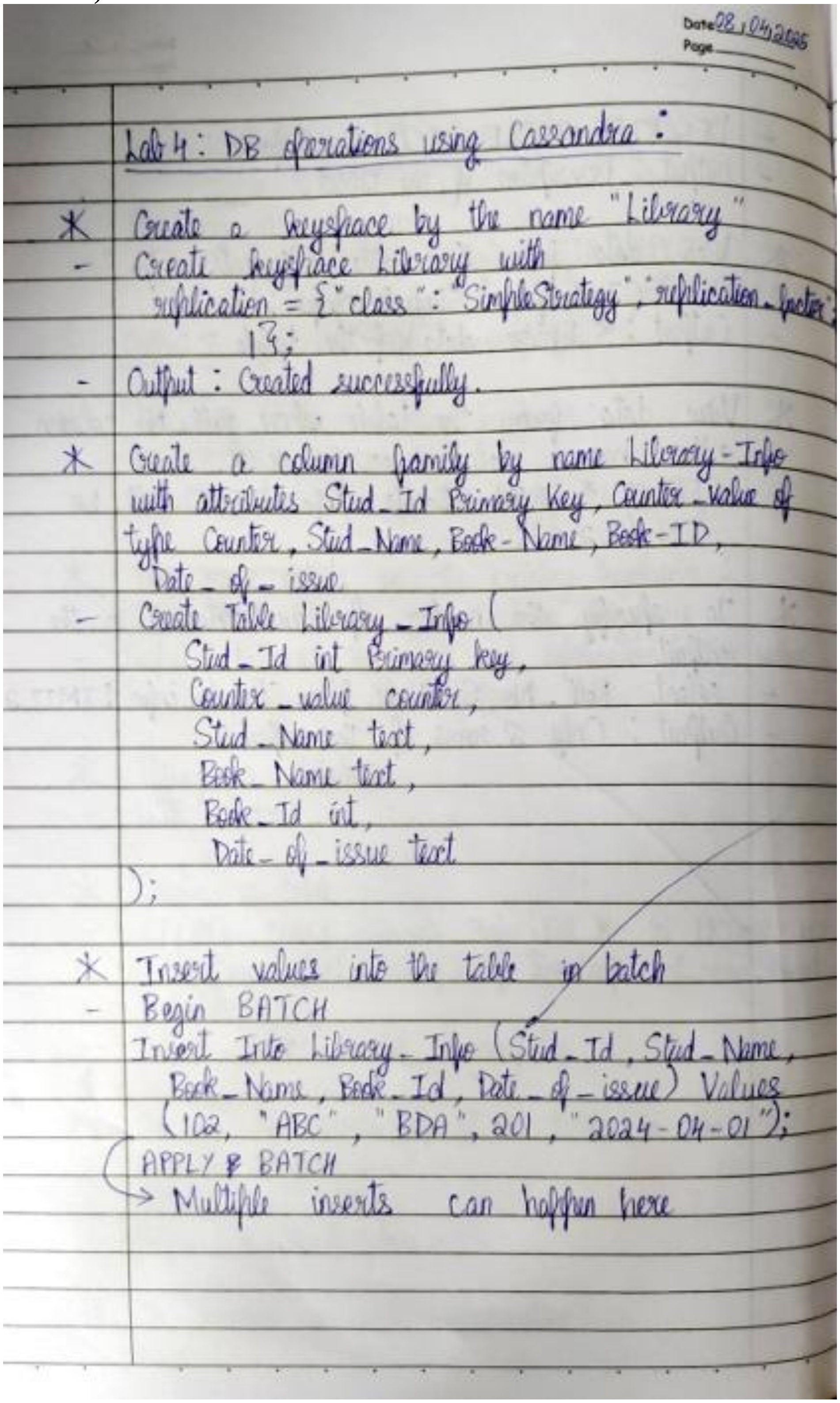


```
Atlas atlas-wanmtx-shard-0 [primary] Students> db.students.find({ "Name": /^A/ })
[
  {
    _id: ObjectId("661ce9dc76a00ff8cc51dae2"),
    Rollno: 11,
    Name: 'Alicee',
    Age: 21,
    ContactNo: '9876543210',
    'Email-Id': 'alice@example.com',
    grade: 'B',
    hobby: 'Painting'
  }
]
```

Experiment - 4

1.3.3 Question:

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



Date 08/04/2025
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Lab 4 : DB operations using Cassandra :

* Create a keyspace by the name "Library"

- Create keyspace Library with
  replication = {"class": "SimpleStrategy", "replication_factor":
  1};

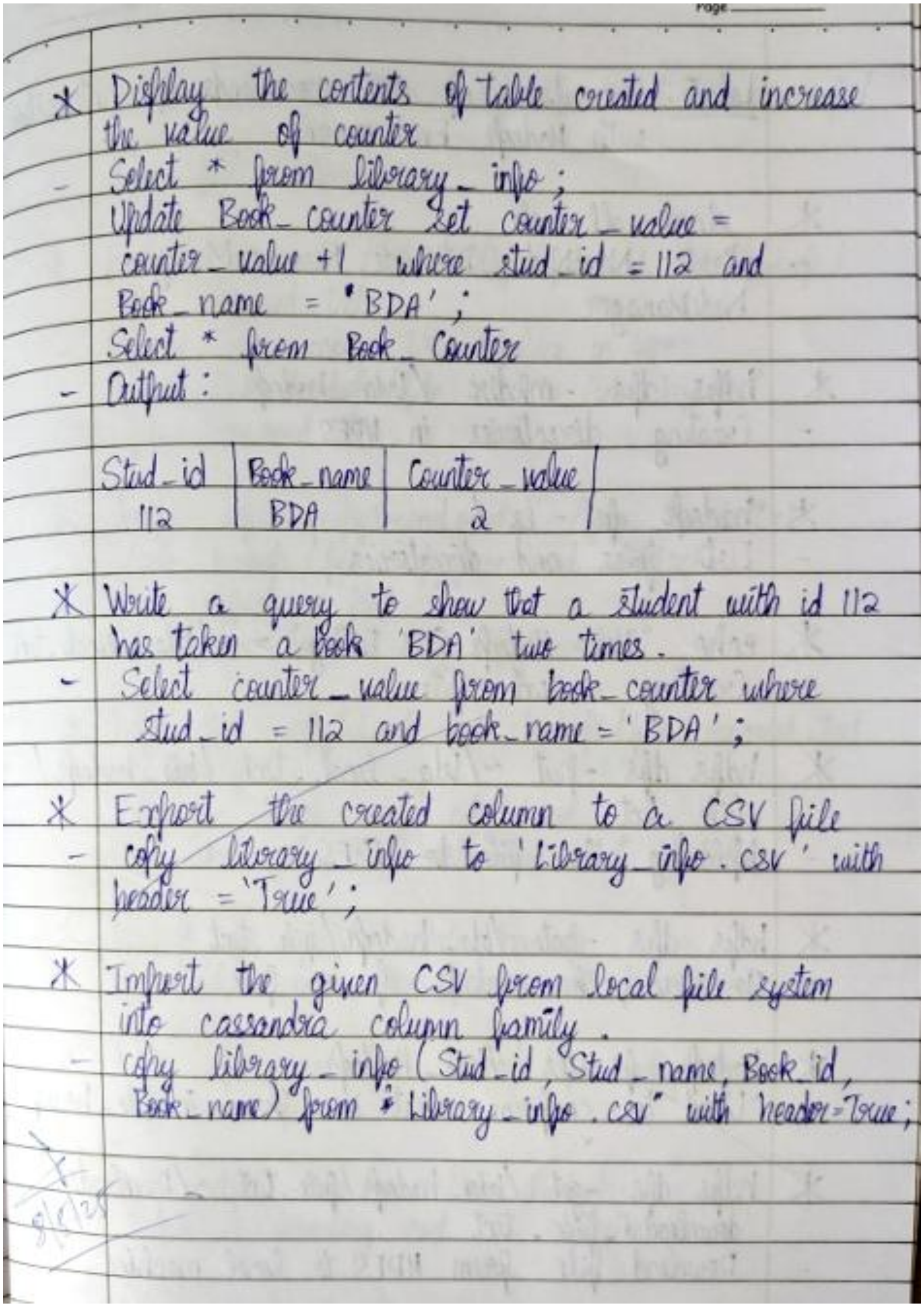
- Output : Created successfully.

* 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

- Create Table Library_Info (
      Stud_Id int Primary key,
      Counter_value counter,
      Stud_Name text,
      Book_Name text,
      Book_Id int,
      Date_of_issue text
  );

* Insert values into the table in batch

- Begin BATCH
  Insert Into Library_Info (Stud_Id, Stud_Name,
    Book_Name, Book_Id, Date_of_issue) Values
    (102, "ABC", "BDA", 201, "2024-04-01");
  APPLY ~~B~~ BATCH
  → Multiple inserts can happen here



* Display the contents of table created and increase the value of counter

```
- Select * from library_info;
  Update Book_counter Set counter_value =
  counter_value +1 where stud_id = 112 and
  Book_name = 'BDA';
  Select * from Book_Counter
```

- Output:

Stud_id	Book_name	Counter_value
112	BDA	2

* Write a query to show that a student with id 112 has taken a book 'BDA' two times.

```
- Select counter_value from book_counter where
  stud_id = 112 and book_name = 'BDA';
```

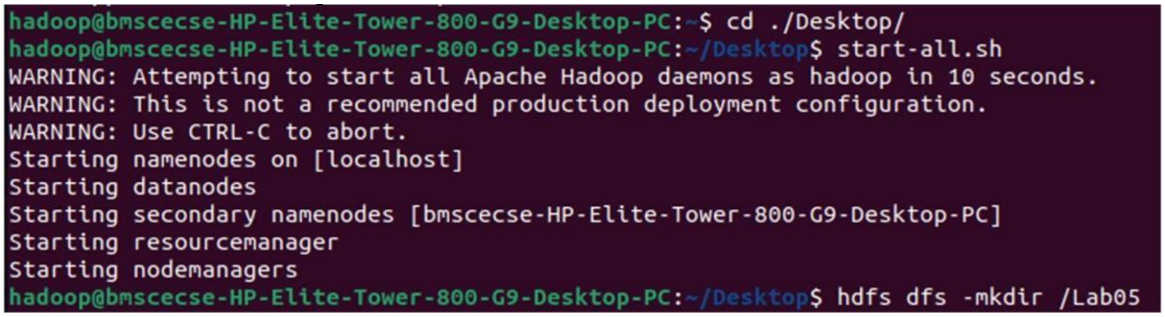
* Export the created column to a CSV file

```
- copy library_info to 'Library_info.csv' with
  header = 'True';
```

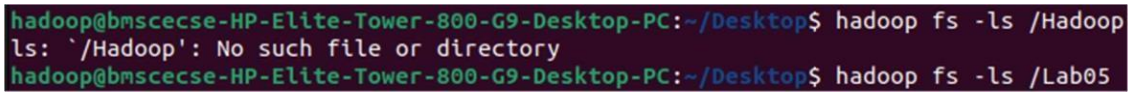
* Import the given CSV from local file system into cassandra column family.

```
- copy library_info (Stud_id, Stud_name, Book_id,
  Book_name) from "Library_info.csv" with header=True;
```

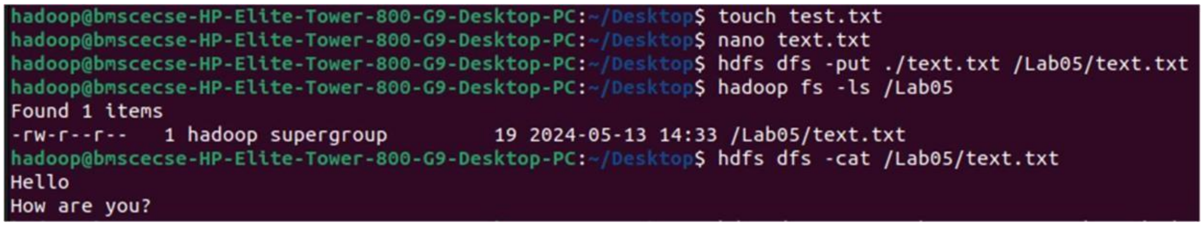
1.3.4 Code with Output:



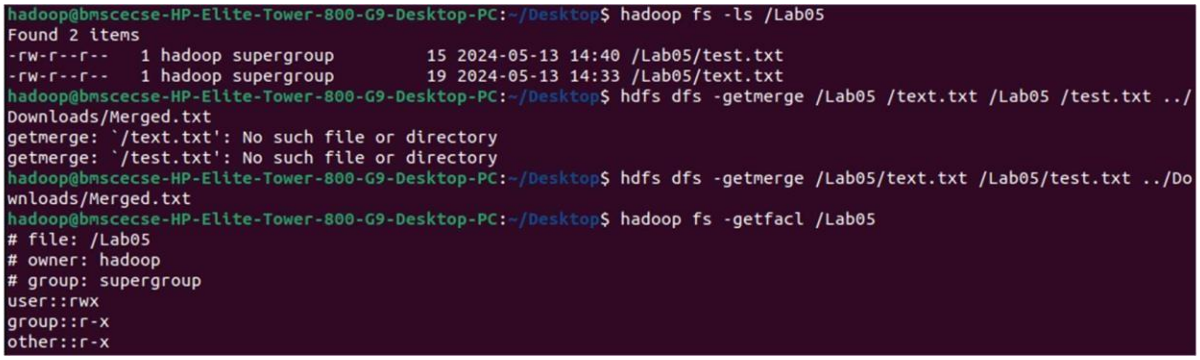
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ cd ./Desktop/
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: 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
```



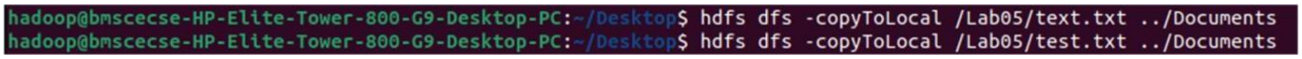
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Hadoop
ls: `/Hadoop': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab05
```



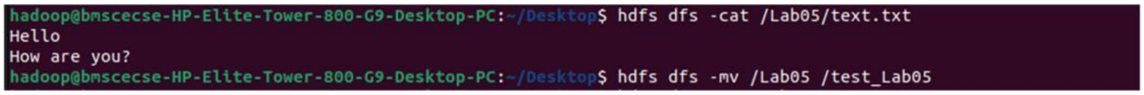
```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ touch test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -put ./text.txt /Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$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

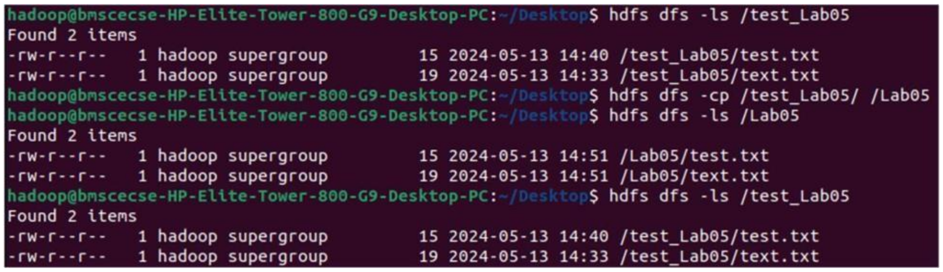


```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/text.txt ../Documents
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab05/test.txt ../Documents
```



```
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
```

`

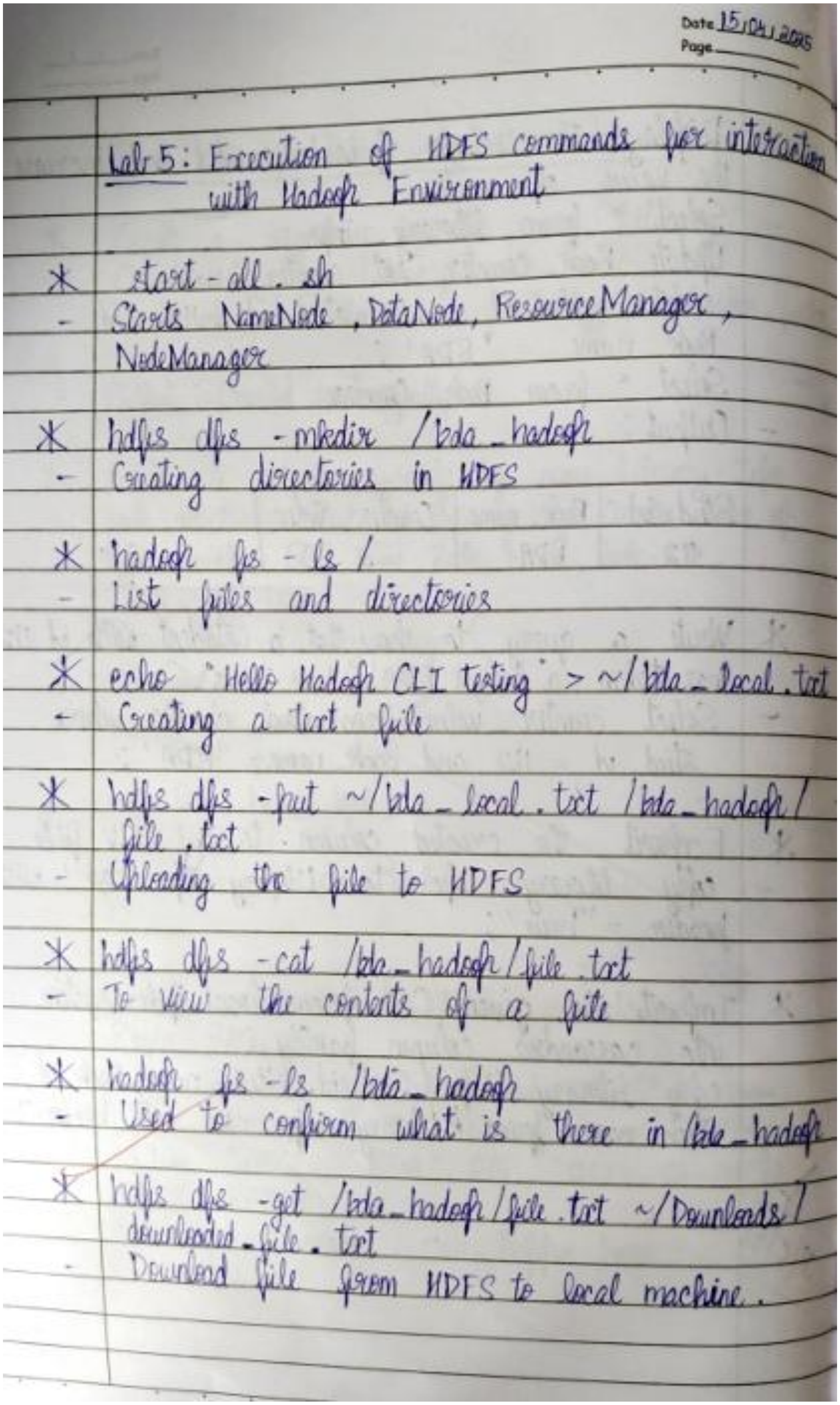


```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab05
Found 2 items
-rw-r--r--   1 hadoop supergroup         15 2024-05-13 14:40 /test_Lab05/test.txt
-rw-r--r--   1 hadoop supergroup         19 2024-05-13 14:33 /test_Lab05/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ 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 - 6

1.3.5 Question:

Implement WordCount Program on Hadoop framework.



Date 15/04/2025
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Lab 5: Execution of HDFS commands for interaction with Hadoop Environment

* start-all.sh
- Starts NameNode, DataNode, ResourceManager, NodeManager

* hdfs dfs -mkdir /bda_hadoop
- Creating directories in HDFS

* hadoop fs -ls /
- List files and directories

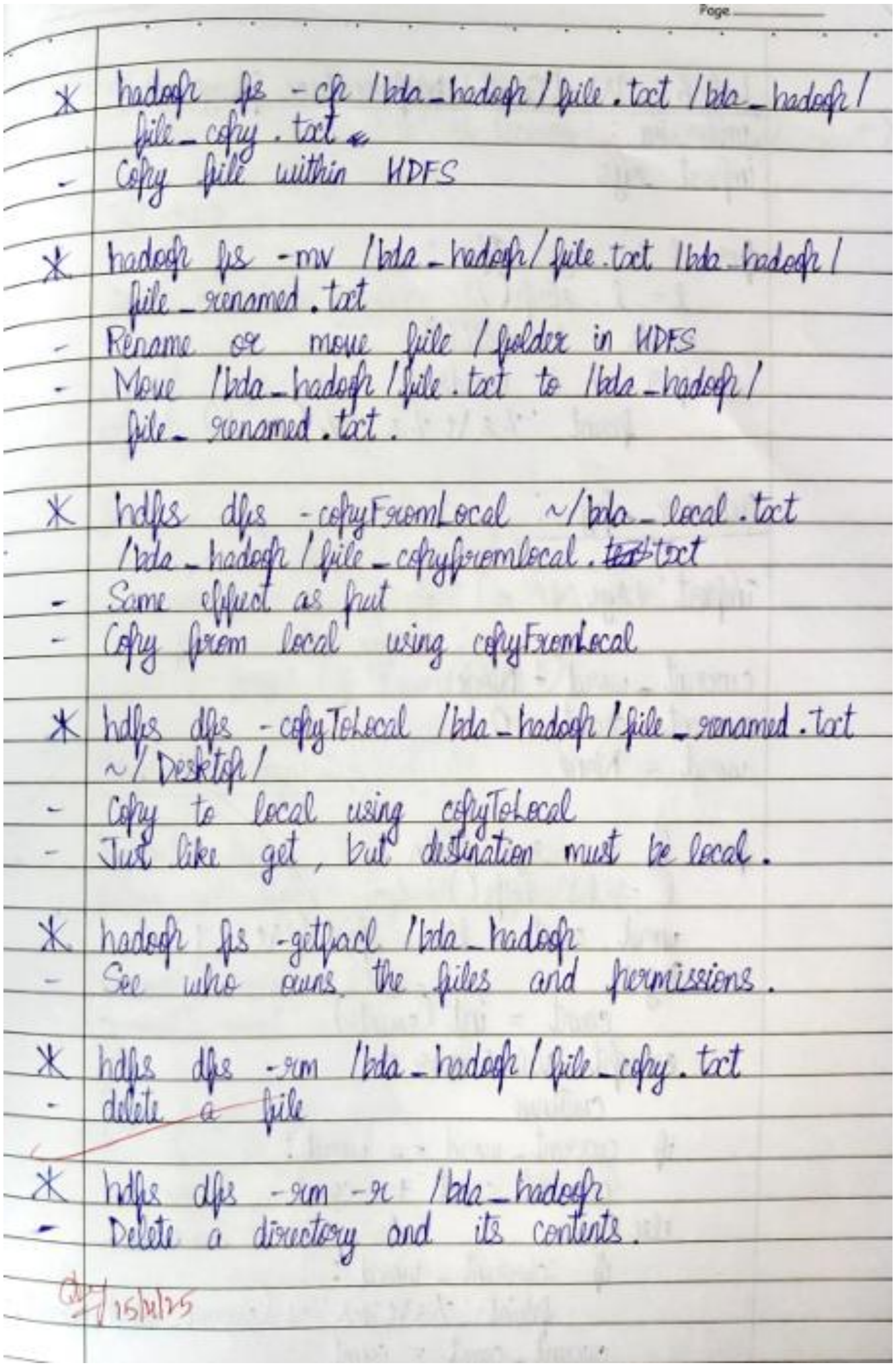
* echo "Hello Hadoop CLI testing" > ~/bda_local.txt
- Creating a text file

* hdfs dfs -put ~/bda_local.txt /bda_hadoop/file.txt
- Uploading the file to HDFS

* hdfs dfs -cat /bda_hadoop/file.txt
- To view the contents of a file

* hadoop fs -ls /bda_hadoop
- Used to confirm what is there in /bda_hadoop

* hdfs dfs -get /bda_hadoop/file.txt ~/Downloads/downloaded_file.txt
- Download file from HDFS to local machine.



Page

* hadoop fs -cp /bda_hadoop/file.txt /bda_hadoop/file_copy.txt
- Copy file within HDFS

* hadoop fs -mv /bda_hadoop/file.txt /bda_hadoop/file_renamed.txt
- Rename or move file / folder in HDFS
- Move /bda_hadoop/file.txt to /bda_hadoop/file_renamed.txt.

* hdfs dfs -copyFromLocal ~/bda_local.txt /bda_hadoop/file_copyfromlocal.~~txt~~txt
- Same effect as put
- Copy from local using copyFromLocal

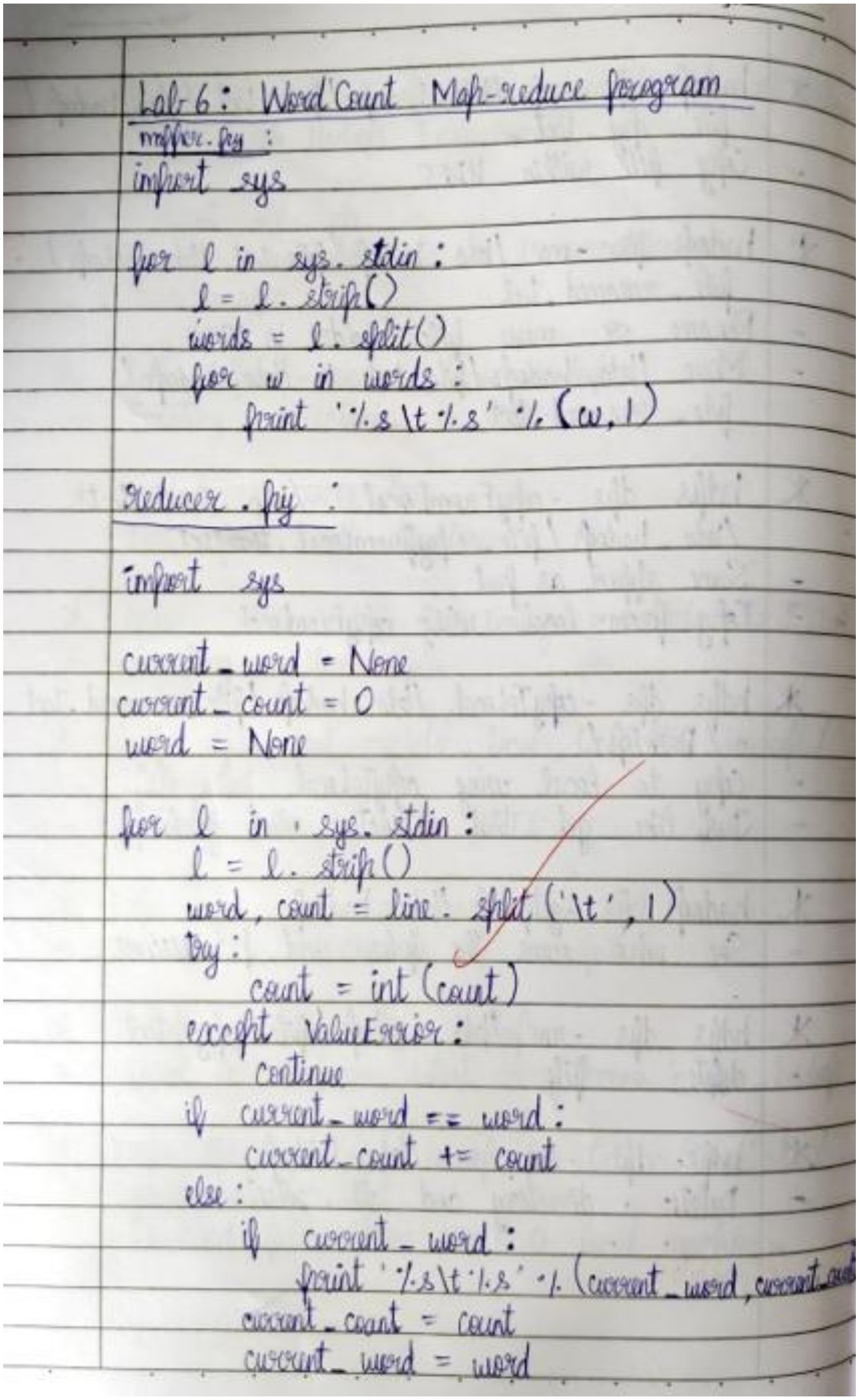
* hdfs dfs -copyToLocal /bda_hadoop/file_renamed.txt ~/Desktop/
- Copy to local using copyToLocal
- Just like get, but destination must be local.

* hadoop fs -getfacl /bda_hadoop
- See who owns the files and permissions.

* hdfs dfs -rm /bda_hadoop/file_copy.txt
- delete a file

* hdfs dfs -rm -r /bda_hadoop
- Delete a directory and its contents.

15/11/25



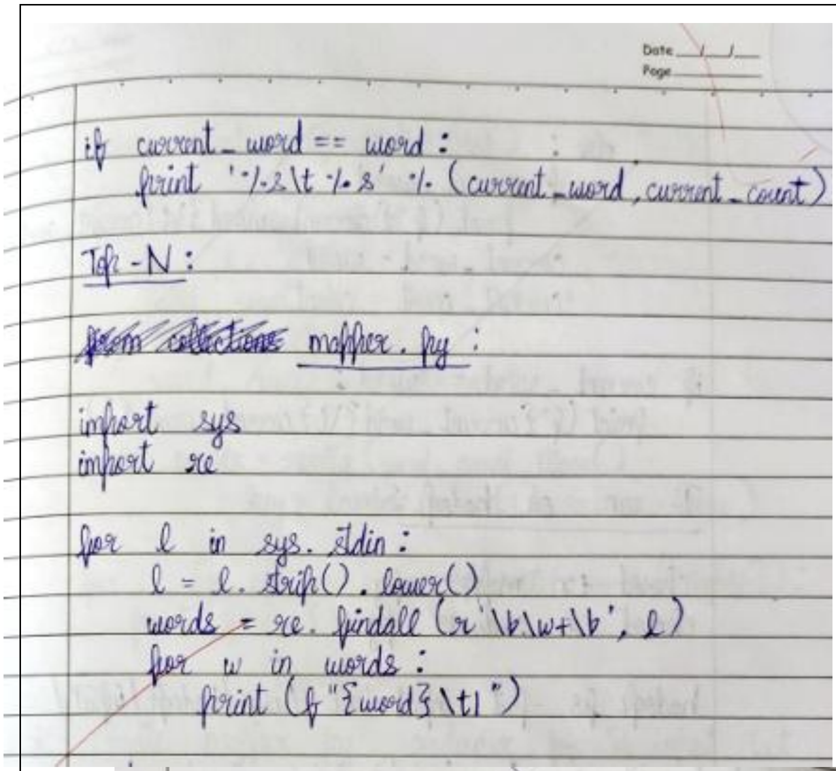
Lab 6 : Word Count Map-reduce program

mapper.py :

```
import sys

for l in sys.stdin :
    l = l.strip()
    words = l.split()
    for w in words :
        print '%s\t%s' % (w, 1)
```

reducer.py :

```
import sys

current_word = None
current_count = 0
word = None

for l in sys.stdin :
    l = l.strip()
    word, count = line.split('\t', 1)
    try :
        count = int(count)
    except ValueError :
        continue
    if current_word == word :
        current_count += count
    else :
        if current_word :
            print '%s\t%s' % (current_word, current_cou
        current_count = count
        current_word = word
```

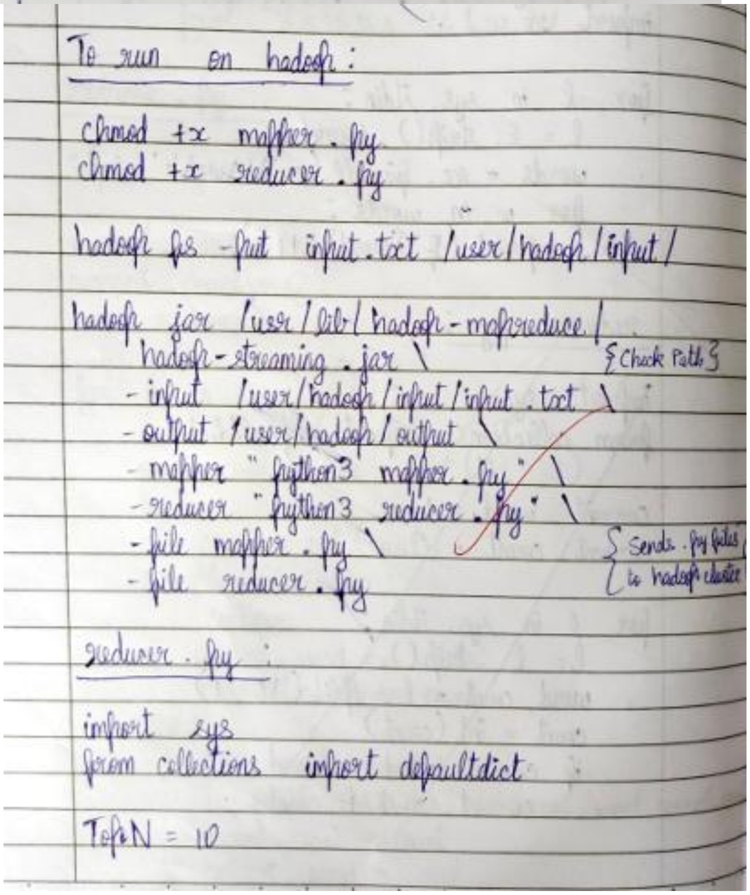


```
if current_word == word :
    print '%s\t %s' % (current_word, current_count)
```

Top-N :

~~from collections~~ mapper.py :

```
import sys
import re

for l in sys.stdin :
    l = l.strip().lower()
    words = re.findall(r'\b\w+\b', l)
    for w in words :
        print (f"{word}\t1")
```

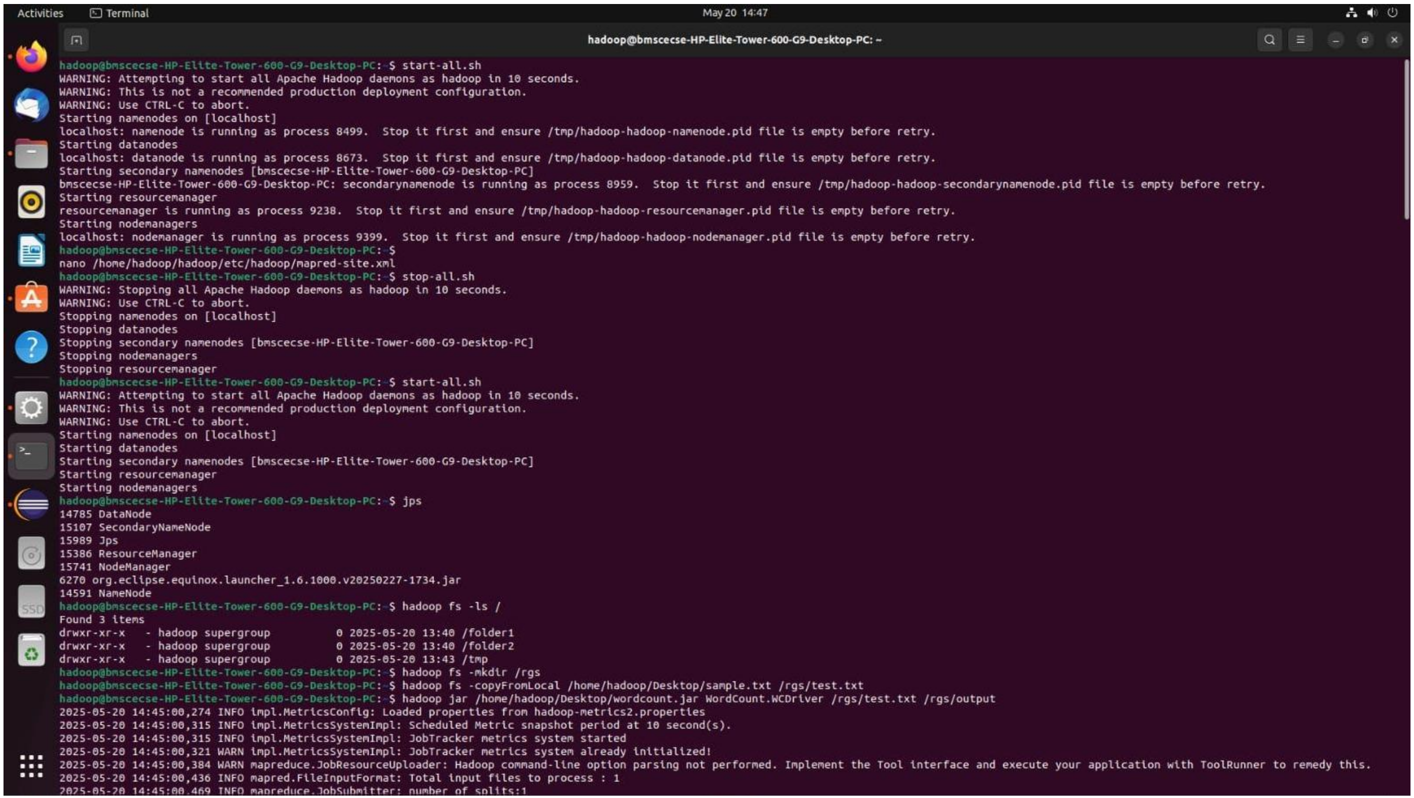


To run on hadoop :

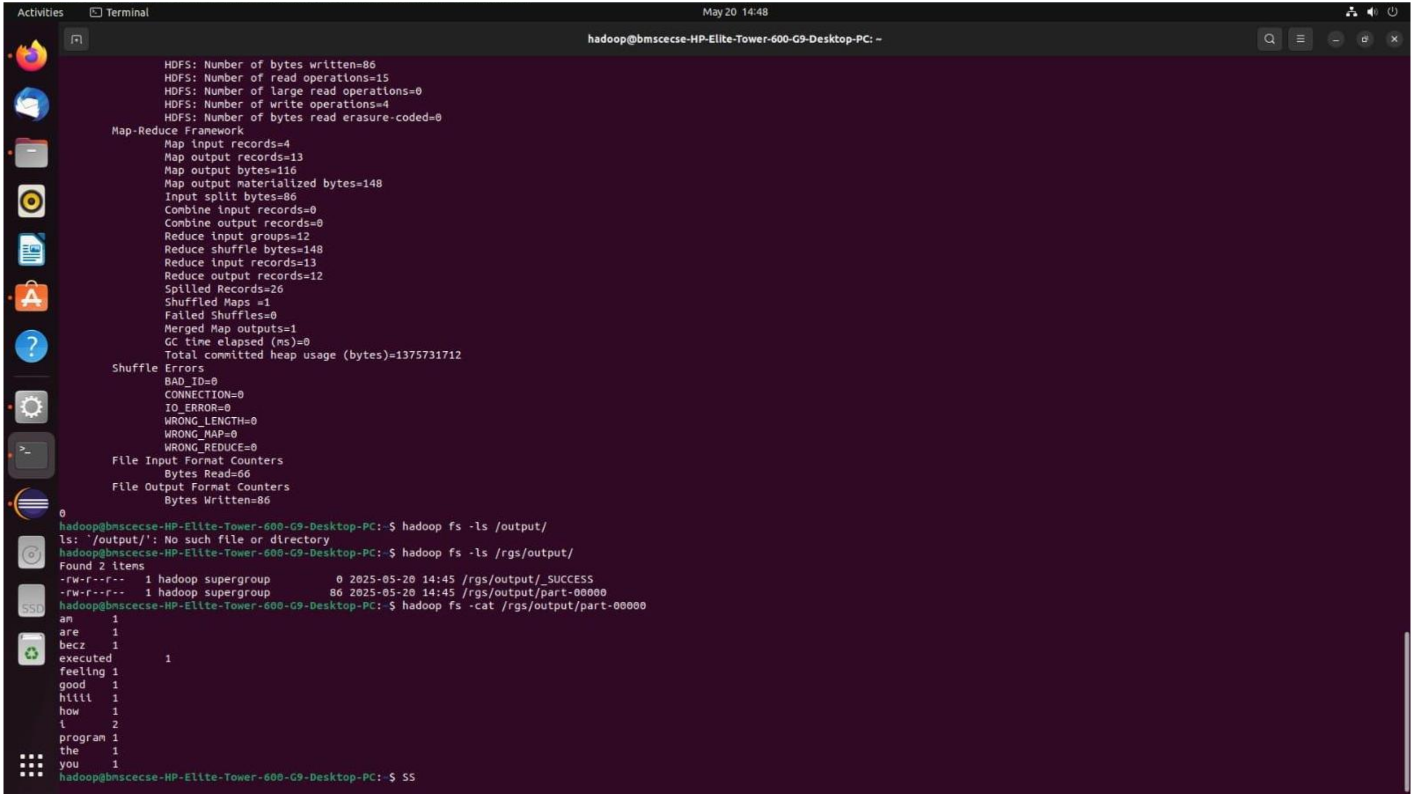
```
chmod +x mapper.py
chmod +x reducer.py

hadoop fs -put input.txt /user/hadoop/input/

hadoop jar /usr/lib/hadoop-mapreduce/
    hadoop-streaming.jar \                    {Check Path}
    -input /user/hadoop/input/input.txt \
    -output /user/hadoop/output \
    -mapper "python3 mapper.py" \
    -reducer "python3 reducer.py" \
    -file mapper.py \                          { Sends .py files
    -file reducer.py                           { to hadoop cluster
```

reducer.py :

```
import sys
from collections import defaultdict

TopN = 10
```



```
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ 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]
localhost: namenode is running as process 8499.  Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty before retry.
Starting datanodes
localhost: datanode is running as process 8673.  Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty before retry.
Starting secondary namenodes [bmscecse-HP-Elite-Tower-600-G9-Desktop-PC]
bmscecse-HP-Elite-Tower-600-G9-Desktop-PC: secondarynamenode is running as process 8959.  Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.pid file is empty before retry.
Starting resourcemanager
resourcemanager is running as process 9238.  Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is empty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 9399.  Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is empty before retry.
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$
nano /home/hadoop/hadoop/etc/hadoop/mapred-site.xml
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ stop-all.sh
WARNING: Stopping all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: Use CTRL-C to abort.
Stopping namenodes on [localhost]
Stopping datanodes
Stopping secondary namenodes [bmscecse-HP-Elite-Tower-600-G9-Desktop-PC]
Stopping nodemanagers
Stopping resourcemanager
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ 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-600-G9-Desktop-PC]
Starting resourcemanager
Starting nodemanagers
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ jps
14785 DataNode
15107 SecondaryNameNode
15989 Jps
15386 ResourceManager
15741 NodeManager
6270 org.eclipse.equinox.launcher_1.6.1000.v20250227-1734.jar
14591 NameNode
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -ls /
Found 3 items
drwxr-xr-x   - hadoop supergroup          0 2025-05-20 13:40 /folder1
drwxr-xr-x   - hadoop supergroup          0 2025-05-20 13:40 /folder2
drwxr-xr-x   - hadoop supergroup          0 2025-05-20 13:43 /tmp
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -mkdir /rgs
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -copyFromLocal /home/hadoop/Desktop/sample.txt /rgs/test.txt
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop jar /home/hadoop/Desktop/wordcount.jar WordCount.WCDriver /rgs/test.txt /rgs/output
2025-05-20 14:45:00,274 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-20 14:45:00,315 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-20 14:45:00,315 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-20 14:45:00,321 WARN impl.MetricsSystemImpl: JobTracker metrics system already initialized!
2025-05-20 14:45:00,384 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2025-05-20 14:45:00,436 INFO mapred.FileInputFormat: Total input files to process : 1
2025-05-20 14:45:00,469 INFO mapreduce.JobSubmitter: number of splits:1
```



```
                HDFS: Number of bytes written=86
                HDFS: Number of read operations=15
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=4
                HDFS: Number of bytes read erasure-coded=0
        Map-Reduce Framework
                Map input records=4
                Map output records=13
                Map output bytes=116
                Map output materialized bytes=148
                Input split bytes=86
                Combine input records=0
                Combine output records=0
                Reduce input groups=12
                Reduce shuffle bytes=148
                Reduce input records=13
                Reduce output records=12
                Spilled Records=26
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=0
                Total committed heap usage (bytes)=1375731712
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=66
        File Output Format Counters
                Bytes Written=86
0
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -ls /output/
ls: `/output/': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -ls /rgs/output/
Found 2 items
-rw-r--r--   1 hadoop supergroup          0 2025-05-20 14:45 /rgs/output/_SUCCESS
-rw-r--r--   1 hadoop supergroup         86 2025-05-20 14:45 /rgs/output/part-00000
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ hadoop fs -cat /rgs/output/part-00000
am      1
are     1
becz    1
executed        1
feeling 1
good    1
hiiii   1
how     1
i       2
program 1
the     1
you     1
hadoop@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ SS
```

1.3.6 Code with Output:

Mapper Code:

```
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:

```
//  Importing  libraries
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> {
// Reduce function
public void reduce(Text key, Iterator<IntWritable> value,
OutputCollector<Text, IntWritable> output,
Reporter rep) throws IOException
{
int count = 0;
// Counting the frequency of each words
while (value.hasNext())
{
IntWritable i = value.next();
count += i.get();
}
output.collect(key, new IntWritable(count));
} }
```

Driver Code: WCDriver Java Class file.

```
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);
}
}
```

1.4 Experiment - 7

1.4.1 Question:

From the following link extract the weather data:

Create a Map Reduce program to:

c) Find average temperature for each year from NCDC data set.

d) Find the mean max temperature for every month.

1.4.2 Code with Output:

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

AverageDriver:

```
package temp;
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.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class AverageDriver {
public static void main(String[] args) throws Exception {
if (args.length != 2) {
System.err.println("Please Enter the input and output parameters");
System.exit(-1);
}
Job job = new Job();
job.setJarByClass(AverageDriver.class);
job.setJobName("Max temperature");
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
job.setMapperClass(AverageMapper.class);
job.setReducerClass(AverageReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
System.exit(job.waitForCompletion(true) ? 0 : 1);
}
}
```

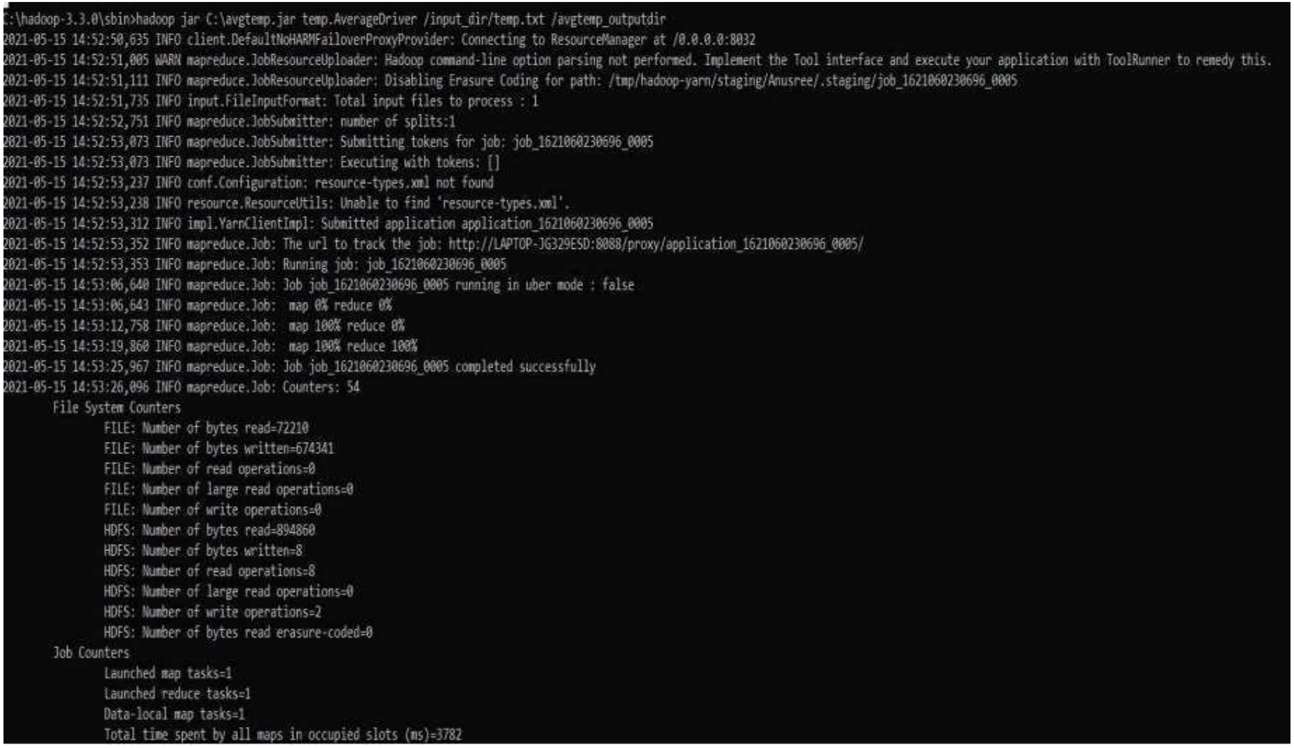
AverageMapper:

```
package temp;
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.mapreduce.Mapper;
public class AverageMapper extends Mapper<LongWritable, Text, Text, IntWritable> {
public static final int MISSING = 9999;
public void map(LongWritable key, Text value, Mapper<LongWritable, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException {
int temperature;
String line = value.toString();
String year = line.substring(15, 19);
if (line.charAt(87) == '+') {
```

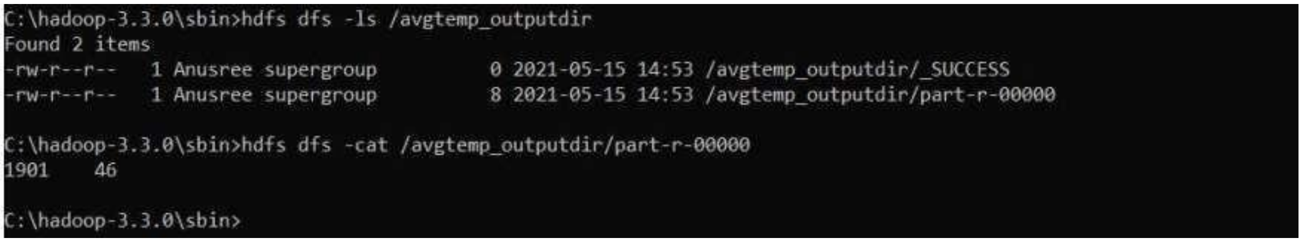
```
temperature = Integer.parseInt(line.substring(88, 92));
} else {
temperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (temperature != 9999 && quality.matches("[01459]"))
context.write(new Text(year), new IntWritable(temperature));
}
}
```

AverageReducer:

```
package temp;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
public class AverageReducer 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 max_temp = 0;
int count = 0;
for (IntWritable value : values) {
max_temp += value.get();
count++;
}
context.write(key, new IntWritable(max_temp / count));
}}
```



```
:\hadoop-3.3.0\sbin>hadoop jar C:\avgtemp.jar temp.AverageDriver /input_dir/temp.txt /avgtemp_outputdir
2021-05-15 14:52:50,635 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-15 14:52:51,005 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2021-05-15 14:52:51,111 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1621060230696_0005
2021-05-15 14:52:51,735 INFO input.FileInputFormat: Total input files to process : 1
2021-05-15 14:52:52,751 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-15 14:52:53,073 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1621060230696_0005
2021-05-15 14:52:53,073 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-15 14:52:53,237 INFO conf.Configuration: resource-types.xml not found
2021-05-15 14:52:53,238 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-15 14:52:53,312 INFO impl.YarnClientImpl: Submitted application application_1621060230696_0005
2021-05-15 14:52:53,352 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG329ESD:8088/proxy/application_1621060230696_0005/
2021-05-15 14:52:53,353 INFO mapreduce.Job: Running job: job_1621060230696_0005
2021-05-15 14:53:06,640 INFO mapreduce.Job: Job job_1621060230696_0005 running in uber mode : false
2021-05-15 14:53:06,643 INFO mapreduce.Job:  map 0% reduce 0%
2021-05-15 14:53:12,758 INFO mapreduce.Job:  map 100% reduce 0%
2021-05-15 14:53:19,860 INFO mapreduce.Job:  map 100% reduce 100%
2021-05-15 14:53:25,967 INFO mapreduce.Job: Job job_1621060230696_0005 completed successfully
2021-05-15 14:53:26,096 INFO mapreduce.Job: Counters: 54
        File System Counters
                FILE: Number of bytes read=72210
                FILE: Number of bytes written=674341
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=894860
                HDFS: Number of bytes written=8
                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
        Job Counters
                Launched map tasks=1
                Launched reduce tasks=1
                Data-local map tasks=1
                Total time spent by all maps in occupied slots (ms)=3782
```



```
C:\hadoop-3.3.0\sbin>hdfs dfs -ls /avgtemp_outputdir
Found 2 items
-rw-r--r--   1 Anusree supergroup          0 2021-05-15 14:53 /avgtemp_outputdir/_SUCCESS
-rw-r--r--   1 Anusree supergroup          8 2021-05-15 14:53 /avgtemp_outputdir/part-r-00000

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /avgtemp_outputdir/part-r-00000
1901    46

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

b) find the mean max temperature for every month

MeanMaxDriver.class

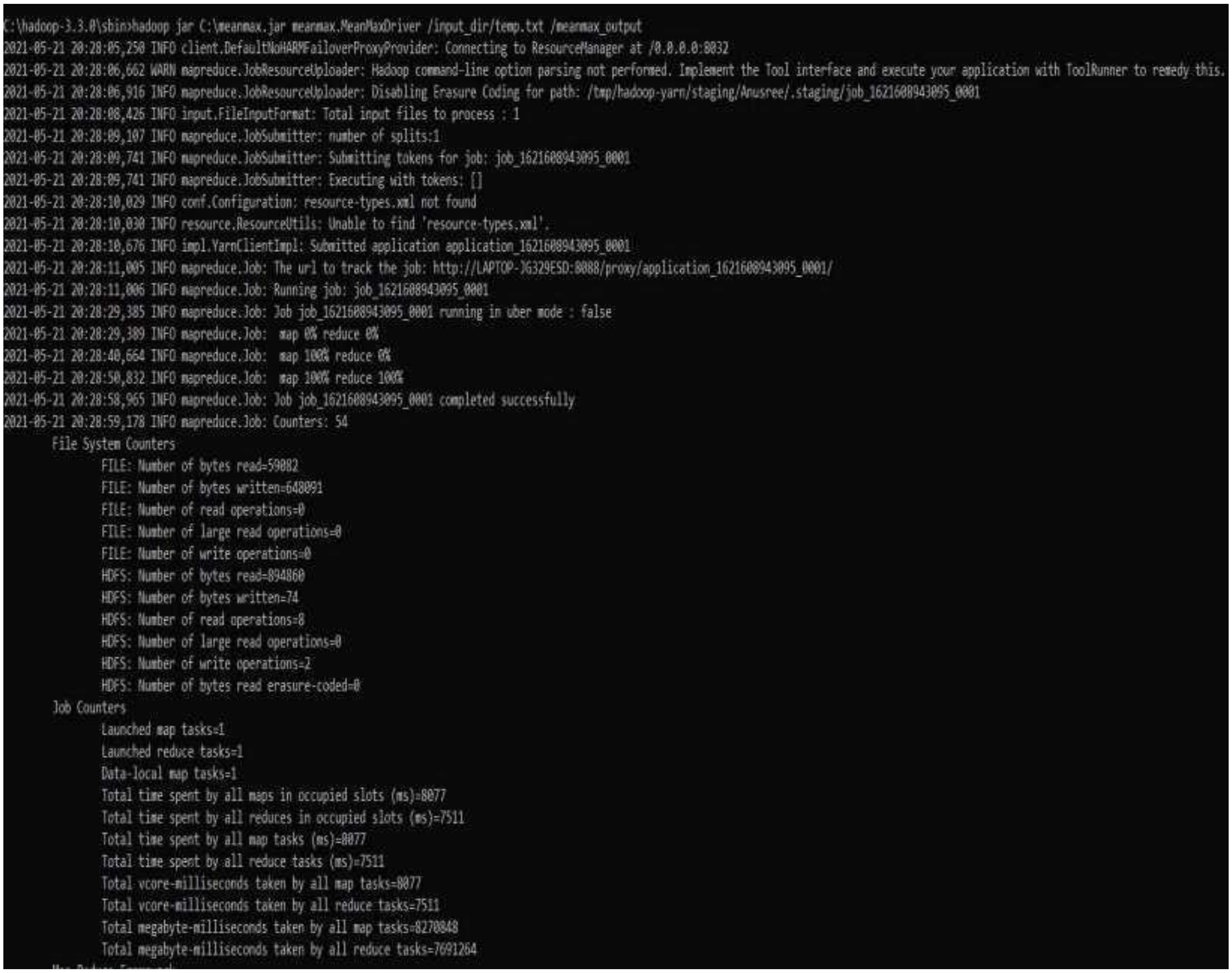
```
package meanmax;
import  org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
public class MeanMaxDriver {
public static void main(String[] args) throws Exception {
if (args.length != 2) {
System.err.println("Please Enter the input and output parameters");
System.exit(-1);
}
Job job = new Job();
job.setJarByClass(MeanMaxDriver.class);
job.setJobName("Max temperature");
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
job.setMapperClass(MeanMaxMapper.class);
job.setReducerClass(MeanMaxReducer.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
System.exit(job.waitForCompletion(true) ? 0 : 1);
}
}
```

MeanMaxMapper.class

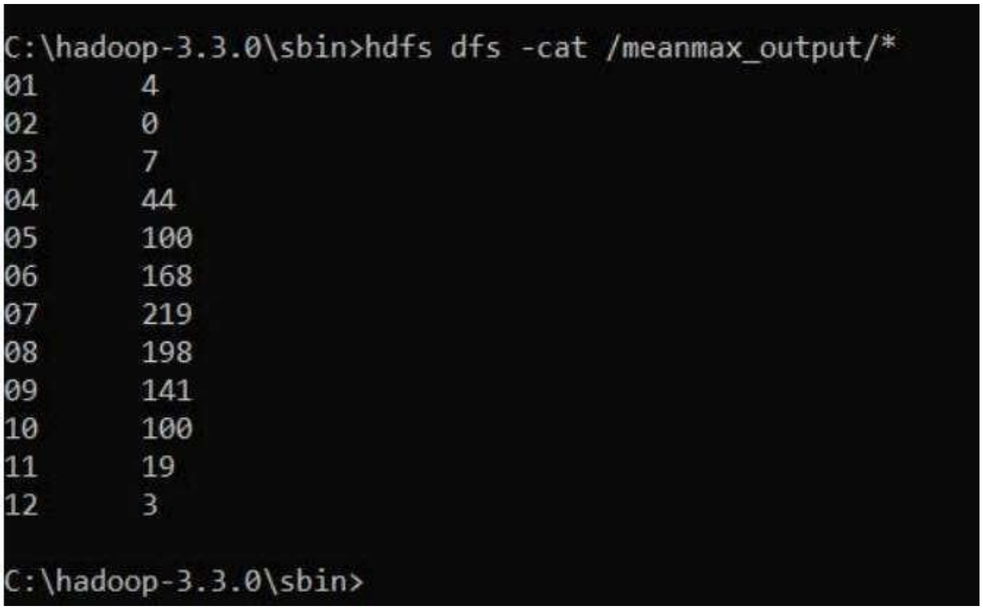
```
package meanmax;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
public class MeanMaxMapper extends Mapper<LongWritable, Text, Text, IntWritable> {
public static final int MISSING = 9999;
public void map(LongWritable key, Text value, Mapper<LongWritable, Text, Text,
IntWritable>.Context context) throws IOException, InterruptedException {
int temperature;
String line = value.toString();
String month = line.substring(19, 21);
if (line.charAt(87) == '+') {
temperature = Integer.parseInt(line.substring(88, 92));
} else {
temperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (temperature != 9999 && quality.matches("[01459]"))
context.write(new Text(month), new IntWritable(temperature));
}
}
```

MeanMaxReducer.class

```
package meanmax;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
public class MeanMaxReducer 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 max_temp = 0;
int total_temp = 0;
int count = 0;
int days = 0;
for (IntWritable value : values) {
int temp = value.get();
if (temp > max_temp)
max_temp = temp;
count++;
if (count == 3) {
total_temp += max_temp;
max_temp = 0;
count = 0;
days++;
}
}
context.write(key, new IntWritable(total_temp / days));
}
}
```



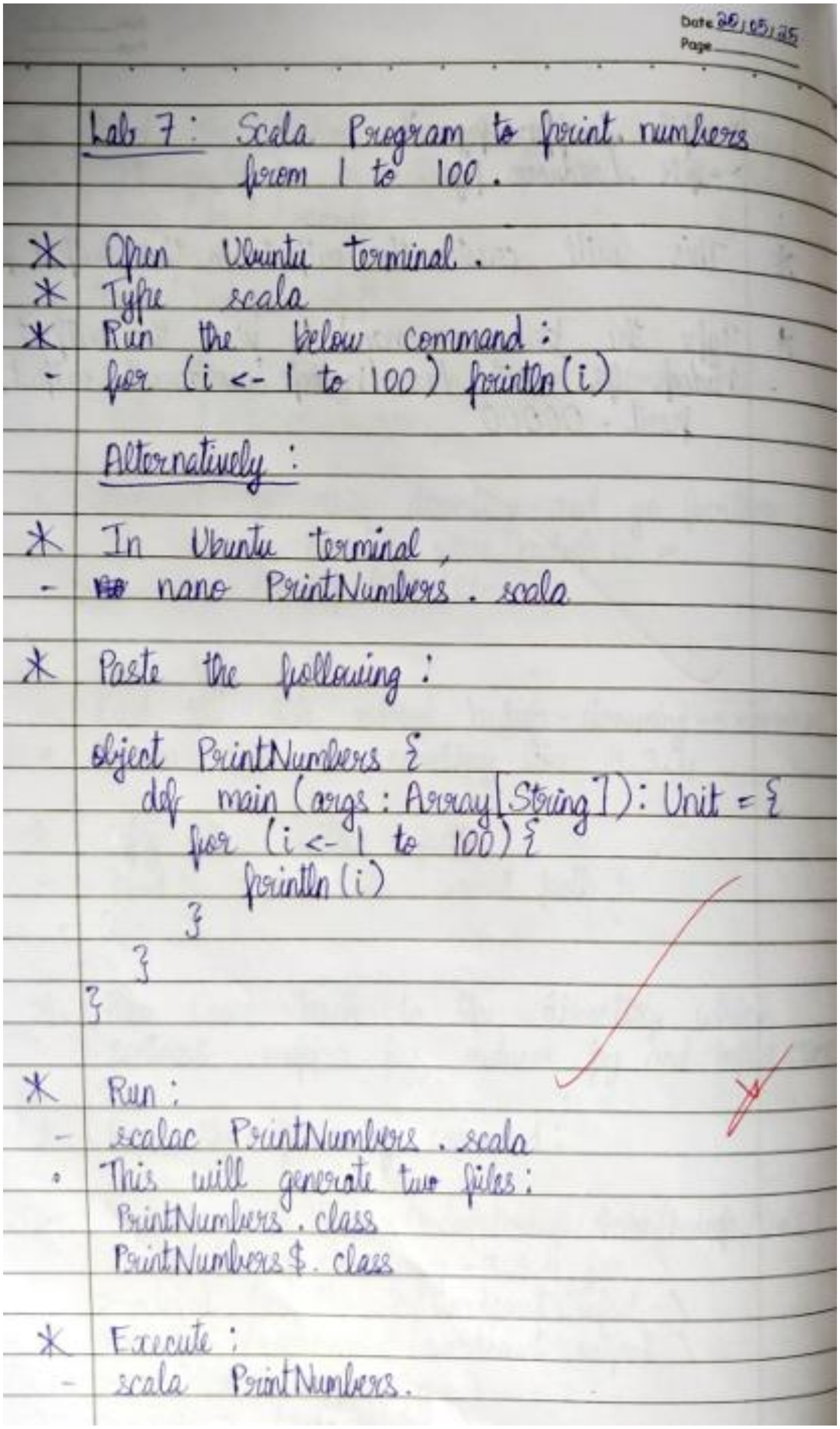
```
C:\hadoop-3.3.0\sbin>hadoop jar C:\meanmax.jar meanmax.MeanMaxDriver /input_dir/temp.txt /meanmax_output
2021-05-21 20:28:05,250 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2021-05-21 20:28:06,662 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2021-05-21 20:28:06,916 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/Anusree/.staging/job_1621608943095_0001
2021-05-21 20:28:08,426 INFO input.FileInputFormat: Total input files to process : 1
2021-05-21 20:28:09,107 INFO mapreduce.JobSubmitter: number of splits:1
2021-05-21 20:28:09,741 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1621608943095_0001
2021-05-21 20:28:09,741 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-05-21 20:28:10,029 INFO conf.Configuration: resource-types.xml not found
2021-05-21 20:28:10,030 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-05-21 20:28:10,676 INFO impl.YarnClientImpl: Submitted application application_1621608943095_0001
2021-05-21 20:28:11,005 INFO mapreduce.Job: The url to track the job: http://LAPTOP-JG329ESD:8088/proxy/application_1621608943095_0001/
2021-05-21 20:28:11,006 INFO mapreduce.Job: Running job: job_1621608943095_0001
2021-05-21 20:28:29,385 INFO mapreduce.Job: Job job_1621608943095_0001 running in uber mode : false
2021-05-21 20:28:29,389 INFO mapreduce.Job:  map 0% reduce 0%
2021-05-21 20:28:40,664 INFO mapreduce.Job:  map 100% reduce 0%
2021-05-21 20:28:50,832 INFO mapreduce.Job:  map 100% reduce 100%
2021-05-21 20:28:58,965 INFO mapreduce.Job: Job job_1621608943095_0001 completed successfully
2021-05-21 20:28:59,178 INFO mapreduce.Job: Counters: 54
        File System Counters
                FILE: Number of bytes read=59082
                FILE: Number of bytes written=648091
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=894860
                HDFS: Number of bytes written=74
                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
        Job Counters
                Launched map tasks=1
                Launched reduce tasks=1
                Data-local map tasks=1
                Total time spent by all maps in occupied slots (ms)=8077
                Total time spent by all reduces in occupied slots (ms)=7511
                Total time spent by all map tasks (ms)=8077
                Total time spent by all reduce tasks (ms)=7511
                Total vcore-milliseconds taken by all map tasks=8077
                Total vcore-milliseconds taken by all reduce tasks=7511
                Total megabyte-milliseconds taken by all map tasks=8270848
                Total megabyte-milliseconds taken by all reduce tasks=7691264
```



```
C:\hadoop-3.3.0\sbin>hdfs dfs -cat /meanmax_output/*
01      4
02      0
03      7
04      44
05      100
06      168
07      219
08      198
09      141
10      100
11      19
12      3

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

Experiment – 8

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



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Lab 7: Scala Program to print numbers from 1 to 100.

* Open Ubuntu terminal.
* Type scala
* Run the below command:

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

Alternatively:

* In Ubuntu terminal,

```
- nano PrintNumbers.scala
```

* Paste the following:

```
object PrintNumbers {
    def main (args : Array[String]): Unit = {
        for (i <- 1 to 100) {
            println (i)
        }
    }
}
```

* Run:

```
- scalac PrintNumbers.scala
```

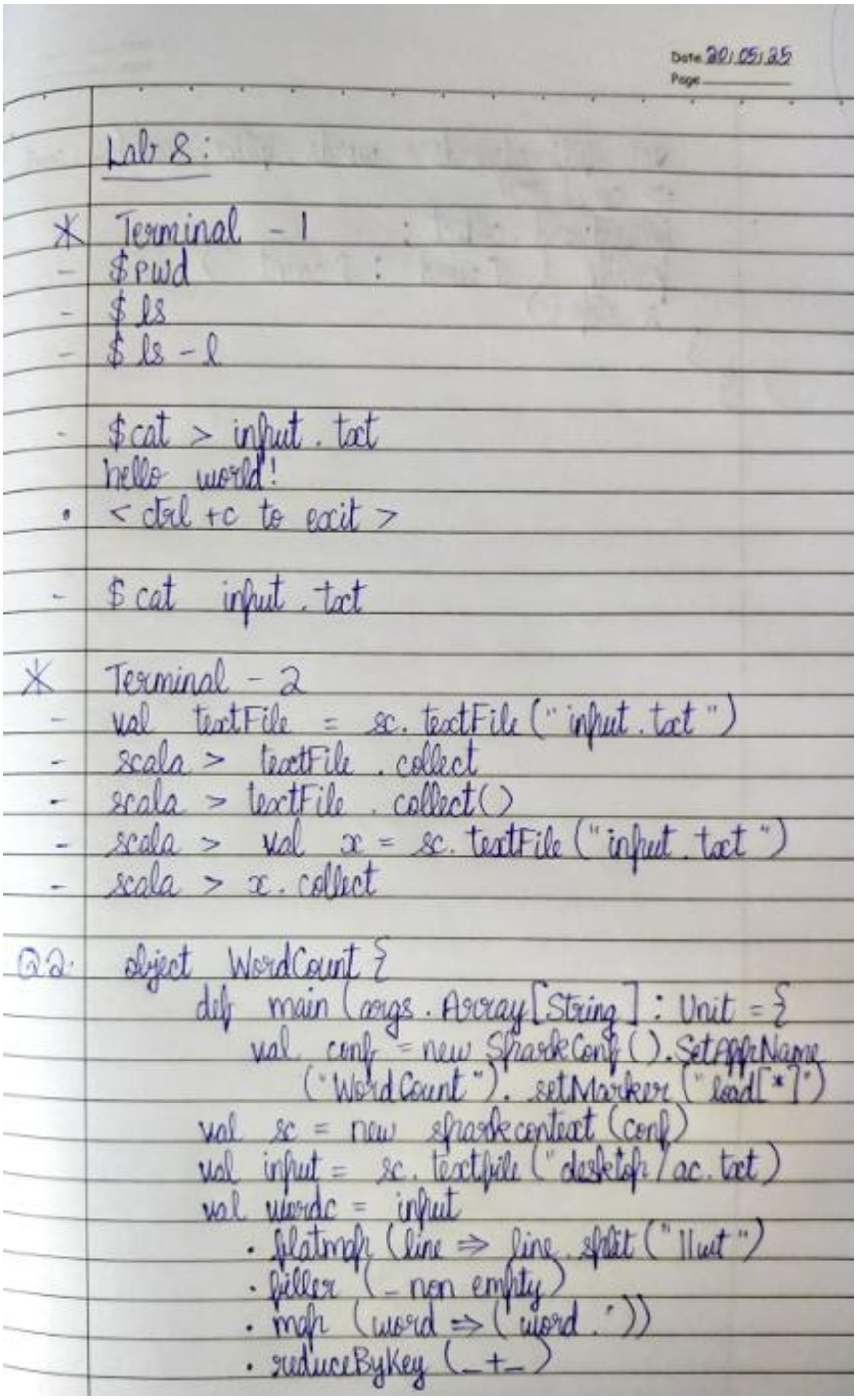
. This will generate two files:
PrintNumbers.class
PrintNumbers$.class

* Execute:

```
- scala PrintNumbers.
```

Experiment – 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.



Date 20.05.25
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Lab 8:

* Terminal - 1

```
- $pwd
- $ls
- $ls -l

- $cat > input.txt
  hello world!
• < ctrl +c to exit >

- $cat input.txt
```

* Terminal - 2

```
- val textFile = sc.textFile("input.txt")
- scala > textFile.collect
- scala > textFile.collect()
- scala > val x = sc.textFile("input.txt")
- scala > x.collect
```

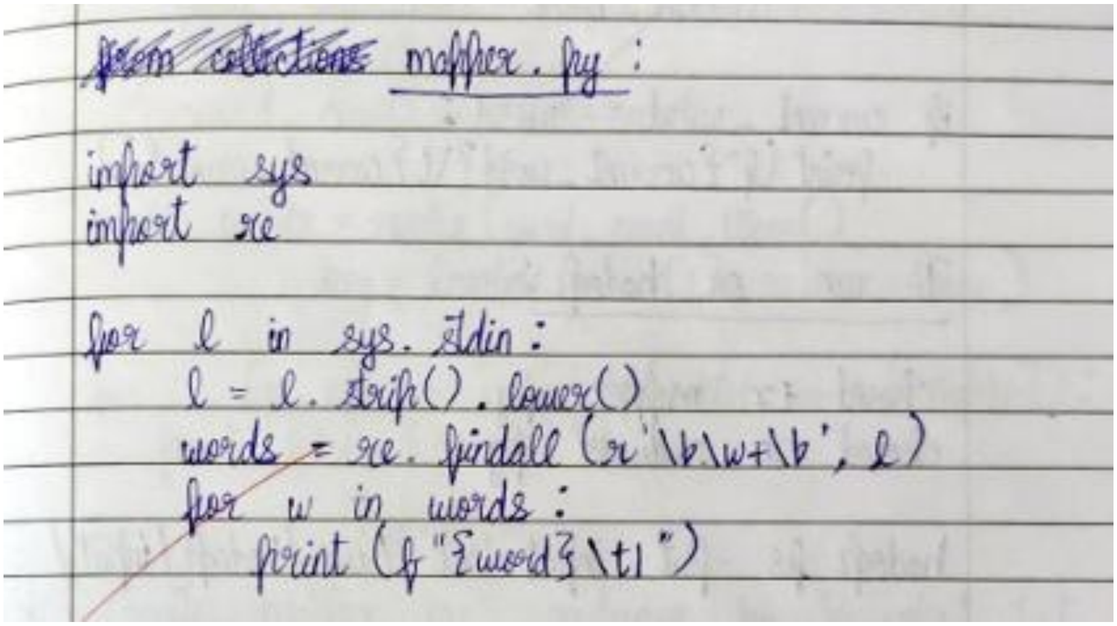
Q2:

```
object WordCount {
      def main (args . Array[String] : Unit = {
          val conf = new SparkConf().SetAppName
              ("WordCount"). setMarker ("load[*]")
      val sc = new sparkcontext (conf)
      val input = sc. textfile ("desktop/ac.txt)
      val wordc = input
          . flatmap (line => line. split ("11ut")
          . filler (_ non empty)
          . map (word => (word . '))
          . reduceByKey (_+_)
```

Experiment - 9

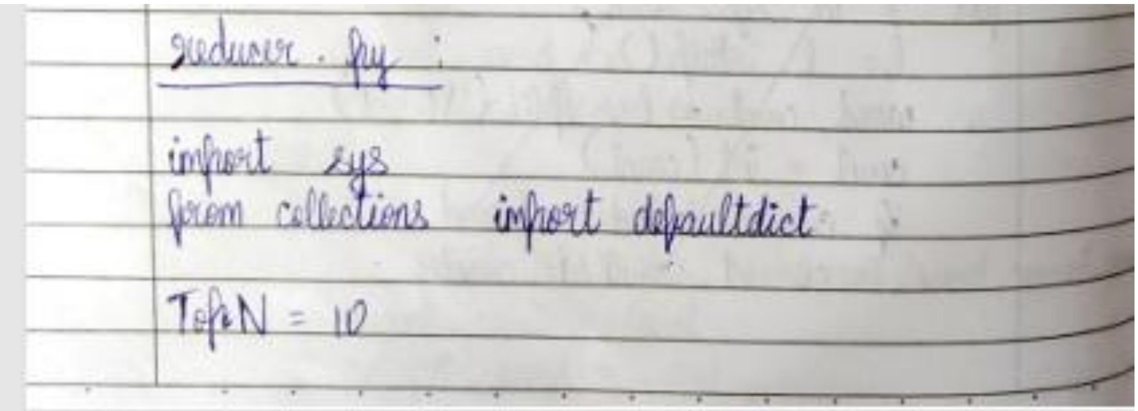
1.4.3 Question:

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.



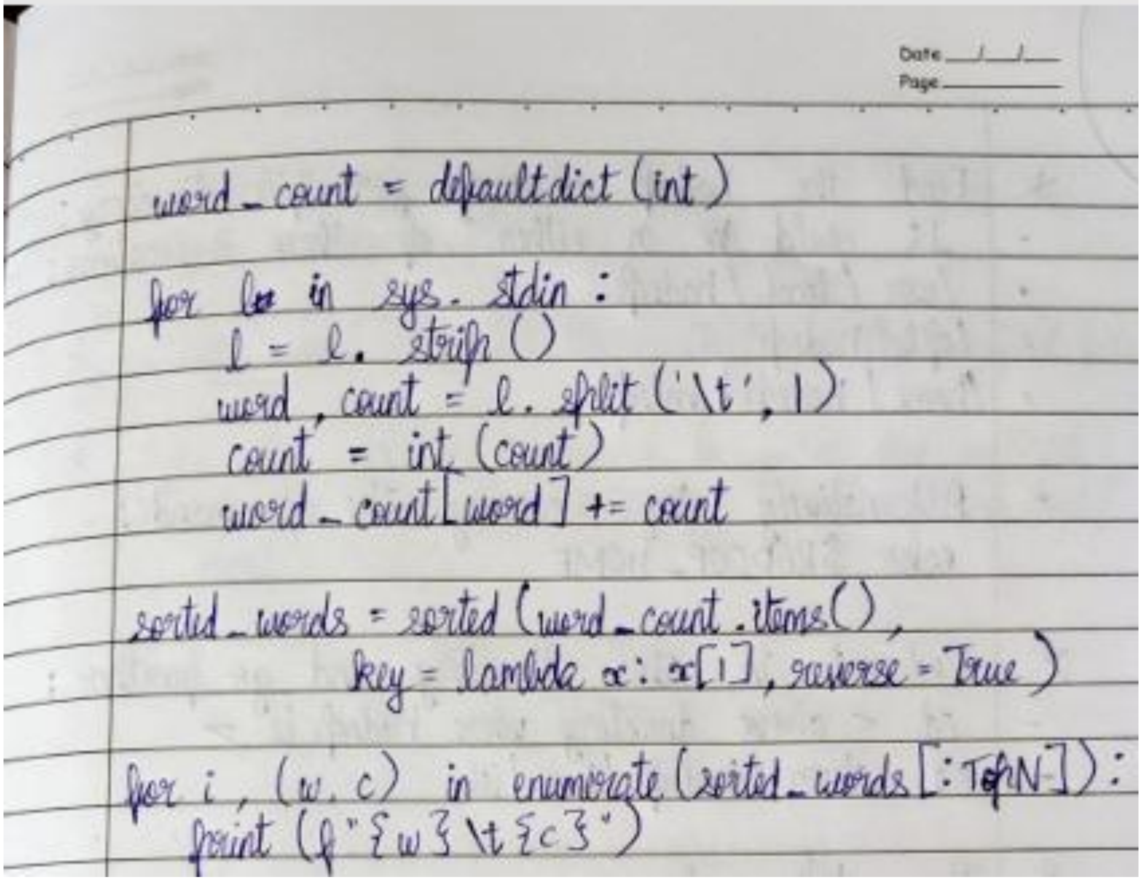
~~from collections~~ mapper.py :

```
import sys
import re

for l in sys. stdin :
    l = l. strip() . lower()
    words = re. findall (r'\b\w+\b', l)
    for w in words :
        print (f"{word}\t1")
```



reducer . py :

```
import sys
from collections import defaultdict

TopN = 10
```



Date ___/___/___
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```
word_count = defaultdict(int)

for l in sys.stdin:
    l = l.strip()
    word, count = l.split('\t', 1)
    count = int(count)
    word_count[word] += count

sorted_words = sorted(word_count.items(),
            key = lambda x: x[1], reverse = True)

for i, (w, c) in enumerate(sorted_words[:TopN]):
    print(f"{w}\t{c}")
```

1.4.4 Code with Output:

Driver-TopN.class

```
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.class

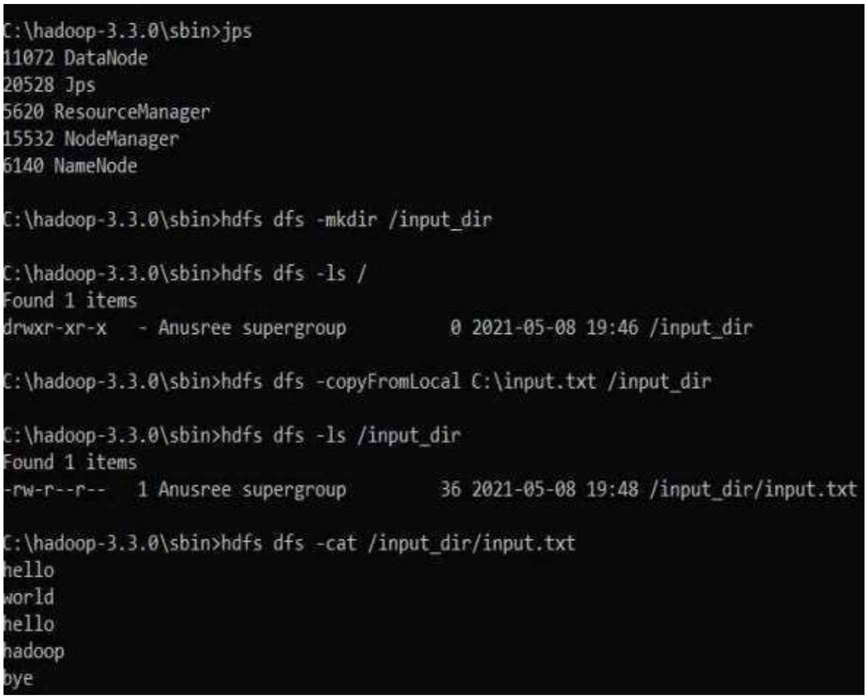
```
package samples.topn;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
public class TopNCombiner extends Reducer<Text, IntWritable, Text, IntWritable> {
public void reduce(Text key, Iterable<IntWritable> 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.class

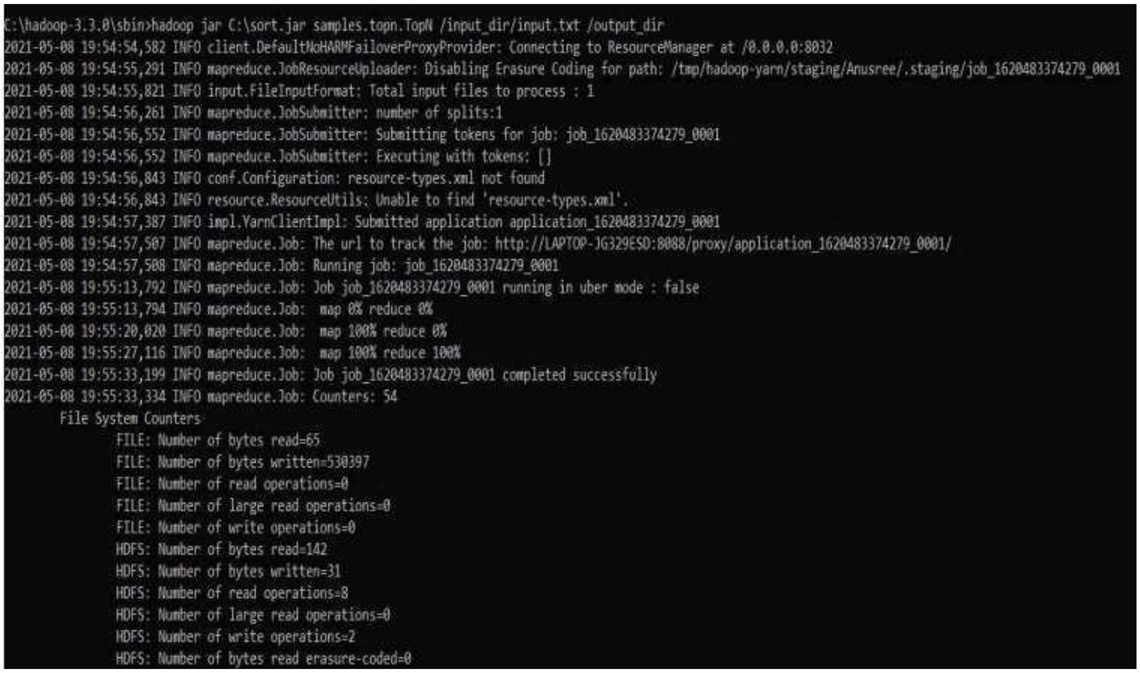
```
package samples.topn;
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
public class TopNMapper extends Mapper<Object, Text, Text, IntWritable> {
private static final 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.class

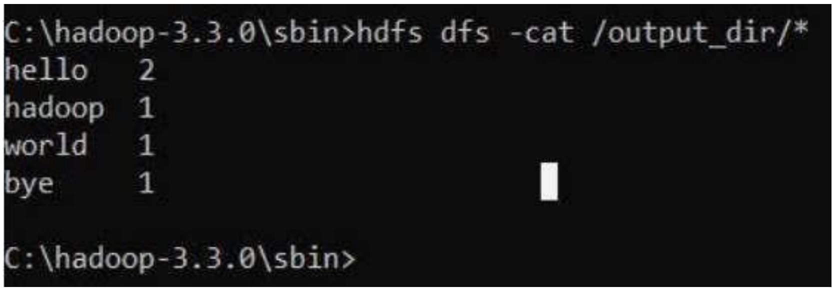
```
package samples.topn;
import java.io.IOException;
import java.util.HashMap;
import java.util.Map;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Reducer;
import utils.MiscUtils;
public class TopNReducer extends Reducer<Text, IntWritable, 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>hdfs dfs -ls /
Found 1 items
drwxr-xr-x   - Anusree supergroup          0 2021-05-08 19:46 /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -copyFromLocal C:\input.txt /input_dir

C:\hadoop-3.3.0\sbin>hdfs dfs -ls /input_dir
Found 1 items
-rw-r--r--   1 Anusree supergroup         36 2021-05-08 19:48 /input_dir/input.txt

C:\hadoop-3.3.0\sbin>hdfs dfs -cat /input_dir/input.txt
hello
world
hello
hadoop
bye
```



```
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>
```