VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

Big Data Analytics (23CS6PEBDA)

Submitted by

Jaydev P (1BM22CS118)

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
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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 (22CS6PEBDA**)" carried out by **Jaydev P(1BM22CS118),** who is a 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 a **Big Data Analytics-(23CS6PCBDA**) work prescribed for the said degree.

Sneha P
Assistant Professor
Department of CSE
BMSCE, Bengaluru

Dr. Kavitha Sooda
Professor and Head
Department of CSE
BMSCE, Bengaluru

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GitHub link: https://github.com/jaydevpolur/6C_BDA_Lab.git

LAB 1 - MongoDB- CRUD Operations Demonstration (Practice and Self Study)

OUTPUT:

```
Microsoft Windows [Version 10.0.22631.4890]
(c) Microsoft Corporation. All rights reserved.

C:\Users\student>mongosh "mongodb+srv://cluster0.qh8blz4.mongodb.net/" --apiVersion 1 --username likhithcs22
Enter password: **********
Current Mongosh Log ID: 67c6c754899c67e814fa4213
Connecting to:          mongodb+srv://<credentials>@cluster0.qh8blz4.mongodb.net/?appName=mongosh+2.4.0
Using MongoDB:          8.0.5 (API Version 1)
Using Mongosh:          2.4.0

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/

Atlas atlas-2vljb9-shard-0 [primary] test> show dbs
e-commerce  108.00 KiB
myDB         40.00 KiB
admin       232.00 KiB
local        15.70 GiB
Atlas atlas-2vljb9-shard-0 [primary] test> use myDB
switched to db myDB
Atlas atlas-2vljb9-shard-0 [primary] myDB> db
myDB
Atlas atlas-2vljb9-shard-0 [primary] myDB> db.createCollection("Student");
{ ok: 1 }
Atlas atlas-2vljb9-shard-0 [primary] myDB> db.Student.insert({RollNo:1,Age:21,Cont:9876,email:"antara.de9@gmail.com"});
...
... db.Student.insert({RollNo:2,Age:22,Cont:9976,email:"anushka.de9@gmail.com"});
...
... db.Student.insert({RollNo:3,Age:21,Cont:5576,email:"anubhav.de9@gmail.com"});
...
... db.Student.insert({RollNo:4,Age:20,Cont:4476,email:"pani.de9@gmail.com"});
...
... db.Student.insert({RollNo:10,Age:23,Cont:2276,email:"rekha.de9@gmail.com"});
DeprecationWarning: Collection.insert() is deprecated. Use insertOne, insertMany, or bulkWrite.
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c898899c67e814fa4218') }
}
Atlas atlas-2vljb9-shard-0 [primary] myDB> db.Student.insert({RollNo:1,Age:21,Cont:9876,email:"antara.de9@gmail.com"});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c8a3899c67e814fa4219') }
}
Atlas atlas-2vljb9-shard-0 [primary] myDB> db.Student.insert({RollNo:2,Age:22,Cont:9976,email:"anushka.de9@gmail.com"});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c8f7899c67e814fa421a') }
}
Atlas atlas-2vljb9-shard-0 [primary] myDB> db.Student.insert({RollNo:3,Age:21,Cont:5576,email:"anubhav.de9@gmail.com"});
{
  acknowledged: true,
  insertedIds: { '0': ObjectId('67c6c8fb899c67e814fa421b') }
```

```
C:\Users\likhi>mongosh "mongodb+srv://cluster0.qh8blz4.mongodb.net/" --apiVersion 1 --username likhithcs22
Enter password: **********
Current Mongosh Log ID: 6833148466c722794490defd
Connecting to:          mongodb+srv://<credentials>@cluster0.qh8blz4.mongodb.net/?appName=mongosh+2.2.9
Using MongoDB:          8.0.9 (API Version 1)
Using Mongosh:          2.2.9
mongosh 2.5.1 is available for download: https://www.mongodb.com/try/download/shell

For mongosh info see: https://docs.mongodb.com/mongodb-shell/

Atlas atlas-2vljb9-shard-0 [primary] test> show dbs
e-commerce  108.00 KiB
myDB         72.00 KiB
admin       312.00 KiB
local        64.34 GiB
Atlas atlas-2vljb9-shard-0 [primary] test> use myDB
switched to db myDB
Atlas atlas-2vljb9-shard-0 [primary] myDB> db
myDB
Atlas atlas-2vljb9-shard-0 [primary] myDB> show collections
Student
```

LAB 2:MongoDB

OUTPUT:

```
mongosh mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000
}
myDB> db.Customers.aggregate ( {$match:{Type:"Z"}},
... {$group : { _id : "$cust_id",
... TotAccBal :{$sum:"$Balance"} } }, {$match:{TotAccBal:{$gt:1200}}});
[
  { _id: 3, TotAccBal: 2300 },
  { _id: 4, TotAccBal: 2300 },
  { _id: 2, TotAccBal: 11200 }
]
myDB> db.Customers.aggregate (
... {$group : { _id : "$cust_id",
... minAccBal :{$min:"$Balance"}, maxAccBal :{$max:"$Balance"} }});
[
  { _id: 3, minAccBal: 2300, maxAccBal: 2300 },
  { _id: 1, minAccBal: 200, maxAccBal: 200 },
  { _id: 4, minAccBal: 2300, maxAccBal: 2300 },
  { _id: 5, minAccBal: 2300, maxAccBal: 2300 },
  { _id: 2, minAccBal: 200, maxAccBal: 11200 }
]
myDB> exit
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongoexport --host localhost --db myDB --collection CUstomers --type=csv --out /home/bmscecse/o.txt --fields "Balance","Type"
2025-03-11T15:21:30.413+0530    connected to: mongodb://localhost/
2025-03-11T15:21:30.413+0530    exported 0 records
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongoexport --host localhost --db myDB --collection Customers --type=csv --out /home/bmscecse/o.txt --fields "Balance","Type"
2025-03-11T15:21:47.812+0530    connected to: mongodb://localhost/
2025-03-11T15:21:47.814+0530    exported 6 records
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongosh
Current Mongosh Log ID: 67d007c15778809737567a2a
Connecting to:          mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.3.7
Using MongoDB:          7.0.16
Using Mongosh:          2.3.7
mongosh 2.4.2 is available for download: https://www.mongodb.com/try/download/shell

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/

------
   The server generated these startup warnings when booting
   2025-03-11T14:05:19.345+05:30: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
   2025-03-11T14:05:22.471+05:30: Access control is not enabled for the database. Read and write access to data and configuration is unrestricted
------

test> use myDB
switched to db myDB
myDB> db.Customers.drop()
true
myDB> exit
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongoimport --db myDB --collection newCust --type=csv --headerline --file /home/bmscecse/o/txt
2025-03-11T15:24:08.278+0530    Failed: open /home/bmscecse/o/txt: no such file or directory
2025-03-11T15:24:08.278+0530    0 document(s) imported successfully. 0 document(s) failed to import.
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongoimport --db myDB --collection Customers --type=csv --headerline --file /home/bmscecse/o.txt
2025-03-11T15:24:56.973+0530    connected to: mongodb://localhost/
2025-03-11T15:24:57.328+0530    6 document(s) imported successfully. 0 document(s) failed to import.
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongosh
Current Mongosh Log ID: 67d00878022dc653c5567a2a
Connecting to:          mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.3.7
Using MongoDB:          7.0.16
```

```
mongosh mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000
2025-03-11T15:24:08.278+0530    0 document(s) imported successfully. 0 document(s) failed to import.
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongoimport --db myDB --collection Customers --type=csv --headerline --file /home/bmscecse/o.txt
2025-03-11T15:24:56.973+0530    connected to: mongodb://localhost/
2025-03-11T15:24:57.328+0530    6 document(s) imported successfully. 0 document(s) failed to import.
bmscecse@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~$ mongosh
Current Mongosh Log ID: 67d00878022dc653c5567a2a
Connecting to:          mongodb://127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.3.7
Using MongoDB:          7.0.16
Using Mongosh:          2.3.7
mongosh 2.4.2 is available for download: https://www.mongodb.com/try/download/shell

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/

------
   The server generated these startup warnings when booting
   2025-03-11T14:05:19.345+05:30: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
   2025-03-11T14:05:22.471+05:30: Access control is not enabled for the database. Read and write access to data and configuration is unrestricted
------

test> use myDB
switched to db myDB
myDB> db.Customers.find()
[
  {
    _id: ObjectId('67d008706d2ac454920b0abf'),
    Balance: 11200,
    Type: 'Z'
  },
  {
    _id: ObjectId('67d008706d2ac454920b0ac0'),
    Balance: 200,
    Type: 'S'
  },
  {
    _id: ObjectId('67d008706d2ac454920b0ac1'),
    Balance: 2300,
    Type: 'Z'
  },
  {
    _id: ObjectId('67d008706d2ac454920b0ac2'),
    Balance: 2300,
    Type: 'Z'
  },
  {
    _id: ObjectId('67d008706d2ac454920b0ac3'),
    Balance: 200,
    Type: 'S'
  },
  {
    _id: ObjectId('67d008706d2ac454920b0ac4'),
    Balance: 2300,
    Type: 'S'
  }
]
myDB>
```

LAB 3:CASSANDRA

OUTPUT:

```
cqlsh> CREATE KEYSPACE Employee WITH replication = {'class':'SimpleStrategy', 'replication_factor':1};
cqlsh> USE Employee;
cqlsh:employee> CREATE TABLE Employee_Info (
            ...     Emp_Id int PRIMARY KEY,
            ...     Emp_Name text,
            ...     Designation text,
            ...     Date_of_Joining date,
            ...     Salary decimal,
            ...     Dept_Name text
            ... );
cqlsh:employee> BEGIN BATCH
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (121, 'John Doe', 'Manager', '2015-06-20', 75000, 'HR');
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (122, 'Jane Smith', 'Engineer', '2017-08-15', 60000, 'IT');
            ... APPLY BATCH;
cqlsh:employee> SELECT * FROM Employee_Info;

 emp_id | date_of_joining | dept_name | designation | emp_name   | salary
--------+-----------------+-----------+-------------+------------+--------
    122 |      2017-08-15 |        IT |    Engineer | Jane Smith |  60000
    121 |      2015-06-20 |        HR |     Manager |   John Doe |  75000

(2 rows)
cqlsh:employee> UPDATE Employee_Info SET Emp_Name = 'John Wick', Dept_Name = 'Security' WHERE Emp_Id = 121;
cqlsh:employee> SELECT * FROM Employee_Info;

 emp_id | date_of_joining | dept_name | designation | emp_name   | salary
--------+-----------------+-----------+-------------+------------+--------
    122 |      2017-08-15 |        IT |    Engineer | Jane Smith |  60000
    121 |      2015-06-20 |  Security |     Manager |  John Wick |  75000
```

```
cqlsh> CREATE KEYSPACE IF NOT EXISTS Employee
   ... WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};
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 DOUBLE,
            ...   Dept_Name TEXT
            ... );
cqlsh:employee> BEGIN BATCH
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (121, 'John Doe', 'Manager', '2018-01-01', 90000, 'HR');
            ...
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (122, 'Alice Smith', 'Developer', '2019-05-21', 75000, 'IT');
            ...
            ... INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (123, 'Rahul Roy', 'Analyst', '2020-07-15', 65000, 'IT');
            ... APPLY BATCH;
cqlsh:employee> UPDATE Employee_Info
            ... SET Emp_Name = 'John Smith', Dept_Name = 'Finance'
            ... WHERE Emp_Id = 121;
cqlsh:employee> select * from Employee_Info;

 emp_id | date_of_joining | dept_name | designation | emp_name    | salary
--------+-----------------+-----------+-------------+-------------+--------
    123 |      2020-07-15 |        IT |     Analyst |   Rahul Roy |  65000
    122 |      2019-05-21 |        IT |   Developer | Alice Smith |  75000
    121 |      2018-01-01 |   Finance |     Manager |  John Smith |  90000

(3 rows)
```

```
(3 rows)
cqlsh:employee> CREATE TABLE IF NOT EXISTS Employee_By_Dept (
            ...   Dept_Name TEXT,
            ...   Salary DOUBLE,
            ...   Emp_Id INT,
            ...   Emp_Name TEXT,
            ...   Designation TEXT,
            ...   Date_of_Joining DATE,
            ...   PRIMARY KEY (Dept_Name, Salary, Emp_Id)
            ... ) WITH CLUSTERING ORDER BY (Salary DESC, Emp_Id ASC);
cqlsh:employee> BEGIN BATCH
            ... INSERT INTO Employee_By_Dept (Dept_Name, Salary, Emp_Id, Emp_Name, Designation, Date_of_Joining)
            ... VALUES ('HR', 90000, 121, 'John Smith', 'Manager', '2018-01-01');
            ...
            ... INSERT INTO Employee_By_Dept (Dept_Name, Salary, Emp_Id, Emp_Name, Designation, Date_of_Joining)
            ... VALUES ('IT', 75000, 122, 'Alice Smith', 'Developer', '2019-05-21');
            ...
            ... INSERT INTO Employee_By_Dept (Dept_Name, Salary, Emp_Id, Emp_Name, Designation, Date_of_Joining)
            ... VALUES ('IT', 65000, 123, 'Rahul Roy', 'Analyst', '2020-07-15');
            ... APPLY BATCH;
cqlsh:employee> SELECT * FROM Employee_By_Dept WHERE Dept_Name = 'IT';

 dept_name | salary | emp_id | date_of_joining | designation | emp_name
-----------+--------+--------+-----------------+-------------+-------------
        IT |  75000 |    122 |      2019-05-21 |   Developer | Alice Smith
        IT |  65000 |    123 |      2020-07-15 |     Analyst |   Rahul Roy

(2 rows)
cqlsh:employee> ALTER TABLE Employee_Info ADD Projects SET<TEXT>;
cqlsh:employee> UPDATE Employee_Info SET Projects = {'ERP System', 'HR Portal'} WHERE Emp_Id = 121;
cqlsh:employee> INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
            ... VALUES (124, 'Sneha Kapoor', 'Tester', '2023-03-10', 55000, 'QA') USING TTL 15;
cqlsh:employee> select * from Employee_Info;

 emp_id | date_of_joining | dept_name | designation | emp_name    | projects                    | salary
--------+-----------------+-----------+-------------+-------------+-----------------------------+--------
    123 |      2020-07-15 |        IT |     Analyst |   Rahul Roy |                        null |  65000
    122 |      2019-05-21 |        IT |   Developer | Alice Smith |                        null |  75000
    121 |      2018-01-01 |   Finance |     Manager |  John Smith | {'ERP System', 'HR Portal'} |  90000

(3 rows)
```

LAB 04:CASSANDRA

OUTPUT:

```
cqlsh:employee> CREATE TABLE Employee_By_Dept (
           ...     Dept_Name text,
           ...     Salary decimal,
           ...     Emp_Id int,
           ...     Emp_Name text,
           ...     Designation text,
           ...     Date_of_Joining date,
           ...     PRIMARY KEY (Dept_Name, Salary)
           ... ) WITH CLUSTERING ORDER BY (Salary DESC);
cqlsh:employee>
cqlsh:employee>
cqlsh:employee>
cqlsh:employee> INSERT INTO Employee_By_Dept (Dept_Name, Salary, Emp_Id, Emp_Name, Designation, Date_of_Joining)
           ... VALUES ('IT', 60000, 122, 'Jane Smith', 'Engineer', '2017-08-15');
cqlsh:employee> INSERT INTO Employee_By_Dept (Dept_Name, Salary, Emp_Id, Emp_Name, Designation, Date_of_Joining)
           ... VALUES ('Security', 75000, 122, 'John Wick', 'Manager', '2015-06-20');
cqlsh:employee>
cqlsh:employee> INSERT INTO Employee_By_Dept (Dept_Name, Salary, Emp_Id, Emp_Name, Designation, Date_of_Joining)
           ... VALUES ('IT', 80000, 123, 'Alice', 'Senior Engineer', '2015-04-10');
cqlsh:employee> SELECT * FROM Employee_By_Dept WHERE Dept_Name = 'IT';

 dept_name | salary | date_of_joining | designation     | emp_id | emp_name
-----------+--------+-----------------+-----------------+--------+------------
        IT |  80000 |      2015-04-10 | Senior Engineer |    123 |      Alice
        IT |  60000 |      2017-08-15 |        Engineer |    122 | Jane Smith

(2 rows)
cqlsh:employee> ALTER TABLE Employee_Info ADD Projects list<text>;
cqlsh:employee> UPDATE Employee_Info SET Projects = ['Website Revamp', 'Cloud Migration'] WHERE Emp_Id = 121;
cqlsh:employee> INSERT INTO Employee_Info (Emp_Id, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name)
           ... VALUES (123, 'Temp User', 'Intern', '2024-01-01', 30000, 'Temp') USING TTL 15;
cqlsh:employee> SELECT * FROM Employee_Info;

 emp_id | date_of_joining | dept_name | designation | emp_name   | projects                                | salary
--------+-----------------+-----------+-------------+------------+-----------------------------------------+--------
    123 |      2024-01-01 |      Temp |      Intern |  Temp User |                                    null |  30000
    122 |      2017-08-15 |        IT |    Engineer | Jane Smith |                                    null |  60000
    121 |      2015-06-20 |  Security |     Manager |  John Wick | ['Website Revamp', 'Cloud Migration'] |  75000
```

```
cqlsh:employee> CREATE KEYSPACE IF NOT EXISTS Library
           ... WITH replication = {'class': 'SimpleStrategy', 'replication_factor': 1};
cqlsh:employee> USE Library;
cqlsh:library> CREATE TABLE IF NOT EXISTS Library_Info (
           ...   Stud_Id INT PRIMARY KEY,
           ...   Stud_Name TEXT,
           ...   Book_Name TEXT,
           ...   Book_Id TEXT,
           ...   Date_of_issue DATE
           ... );
cqlsh:library> CREATE TABLE IF NOT EXISTS Book_Counter (
           ...   Stud_Id INT,
           ...   Book_Name TEXT,
           ...   Counter_value COUNTER,
           ...   PRIMARY KEY ((Stud_Id), Book_Name)
           ... );
cqlsh:library> BEGIN BATCH
           ... INSERT INTO Library_Info (Stud_Id, Stud_Name, Book_Name, Book_Id, Date_of_issue)
           ... VALUES (112, 'Anjali Rao', 'BDA', 'B101', '2024-10-01');
           ...
           ... INSERT INTO Library_Info (Stud_Id, Stud_Name, Book_Name, Book_Id, Date_of_issue)
           ... VALUES (113, 'Karthik N', 'AI', 'B102', '2024-11-11');
           ... APPLY BATCH;
cqlsh:library> UPDATE Book_Counter SET Counter_value = Counter_value + 1 WHERE Stud_Id = 112 AND Book_Name = 'BDA';
cqlsh:library> UPDATE Book_Counter SET Counter_value = Counter_value + 1 WHERE Stud_Id = 112 AND Book_Name = 'BDA';
cqlsh:library> SELECT * FROM Book_Counter WHERE Stud_Id = 112 AND Book_Name = 'BDA';

 stud_id | book_name | counter_value
---------+-----------+---------------
     112 |       BDA |             4

(1 rows)
```

```
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, 'Asha', '2012-03-12', 79.9);
            ... INSERT INTO Students_Info (Roll_No, StudName, DateOfJoining, Last_Exam_Percent)
            ... VALUES (2, 'Kiran', '2012-03-12', 89.9);
            ... INSERT INTO Students_Info (Roll_No, StudName, DateOfJoining, Last_Exam_Percent)
            ... VALUES (3, 'Shanthi', '2012-03-12', 90.9);
            ... INSERT INTO Students_Info (Roll_No, StudName, DateOfJoining, Last_Exam_Percent)
            ... VALUES (4, 'Smith', '2012-03-12', 67.9);
            ... INSERT INTO Students_Info (Roll_No, StudName, DateOfJoining, Last_Exam_Percent)
            ... VALUES (5, 'Rohan', '2012-03-12', 56.9);
            ... APPLY BATCH;
cqlsh:students> SELECT * FROM Students_Info;

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       5 | 2012-03-11 18:30:00.000000+0000 |              56.9 |    Rohan
       1 | 2012-03-11 18:30:00.000000+0000 |              79.9 |     Asha
       2 | 2012-03-11 18:30:00.000000+0000 |              89.9 |    Kiran
       4 | 2012-03-11 18:30:00.000000+0000 |              67.9 |    Smith
       3 | 2012-03-11 18:30:00.000000+0000 |              90.9 |  Shanthi

(5 rows)
```

```
cqlsh> CREATE KEYSPACE Students WITH REPLICATION =
   ... {'class': 'SimpleStrategy', 'replication_factor': '1'};
cqlsh>
cqlsh> USE Students;
cqlsh:students> DESCRIBE KEYSPACES;

companies  library      products    system              system_traces
company    pro          productss   system_auth         system_views
employe    prod         productsss  system_distributed  system_virtual_schema
employee   productname  students    system_schema

cqlsh:students> CREATE TABLE Students_Info (
            ...     Roll_No int PRIMARY KEY,
            ...     StudName text,
            ...     DateOfJoining timestamp,
            ...     last_exam_Percent double
            ... );
cqlsh:students> SELECT * FROM systen.schema_keyspaces;
InvalidRequest: Error from server: code=2200 [Invalid query] message="table schema_keyspaces does not exist"
cqlsh:students>
cqlsh:students> SELECT * FROM system_schema.keyspaces;

 keyspace_name      | durable_writes | replication
--------------------+----------------+-------------------------------------------------------------------------------
          companies |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
        systen_auth |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
       systen_schema |           True |                                 {'class': 'org.apache.cassandra.locator.LocalStrategy'}
            library |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
           products |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
 systen_distributed |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '3'}
             system |           True |                                 {'class': 'org.apache.cassandra.locator.LocalStrategy'}
         productsss |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
               prod |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
                pro |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
      systen_traces |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '2'}
           students |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
            company |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
           employee |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
        productname |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
            employe |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}
           productss |           True | {'class': 'org.apache.cassandra.locator.SimpleStrategy', 'replication_factor': '1'}

(17 rows)
cqlsh:students> DESCRIBE TABLES;

students_info
```

```
cqlsh:students> SELECT * FROM Students_Info WHERE Roll_No IN (1,2,3);

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       1 | 2012-03-11 18:30:00.000000+0000 |              79.9 |     Asha
       2 | 2012-03-11 18:30:00.000000+0000 |              89.9 |    Kiran
       3 | 2012-03-11 18:30:00.000000+0000 |              90.9 |  Shanthi

(3 rows)
cqlsh:students> CREATE INDEX ON Students_Info (StudName);
cqlsh:students> SELECT * FROM Students_Info WHERE StudName = 'Asha';

 roll_no | dateofjoining                   | last_exam_percent | studname
---------+---------------------------------+-------------------+----------
       1 | 2012-03-11 18:30:00.000000+0000 |              79.9 |     Asha

(1 rows)
cqlsh:students> SELECT Roll_No, StudName FROM Students_Info LIMIT 2;

 roll_no | studname
---------+----------
       5 |    Rohan
       1 |     Asha

(2 rows)
cqlsh:students> SELECT Roll_No AS USN FROM Students_Info;

 usn
-----
   5
   1
   2
   4
   3

(5 rows)
cqlsh:students> UPDATE Students_Info
            ... SET StudName = 'David Sheen'
            ... WHERE Roll_No = 2;
cqlsh:students> UPDATE Students_Info SET Roll_No = 6 WHERE Roll_No = 3; -- ❌ ERROR!
InvalidRequest: Error from server: code=2200 [Invalid query] message="PRIMARY KEY part roll_no found in SET part"
```

LAB 05: HDFS

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
```

```
command [genericOptions] [commandOptions]

hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mkdir /Lab6
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 /Lab6
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 /Lab6/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab6
Found 1 items
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:23 /Lab6/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab6/text.txt
hi how are you
how is your job
how is your family
how is your brother
how is your sister
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab6
Found 1 items
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:23 /Lab6/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ nano test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -put ./test.txt /Lab6/test.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /Lab6
Found 2 items
-rw-r--r--   1 hadoop supergroup         34 2025-04-15 14:26 /Lab6/test.txt
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:23 /Lab6/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -getmerge /Lab6 /text.txt /Lab6 /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 /Lab6/text.txt /Lab6/test.txt ../Downloads/Merged.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -getfacl /Lab6
# file: /Lab6
# 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 /Lab6/text.text ../Documents
copyToLocal: `/Lab6/text.text': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab6/text.txt ../Documents
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -copyToLocal /Lab6/test.txt ../Documents
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cat /Lab6/text.txt
hi how are you
how is your job
how is your family
how is your brother
how is your sister
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -mv /Lab6 /test_Lab6
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab6
Found 2 items
-rw-r--r--   1 hadoop supergroup         34 2025-04-15 14:26 /test_Lab6/test.txt
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:23 /test_Lab6/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -cp /test_Lab6/ /Lab6
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /Lab6
Found 2 items
-rw-r--r--   1 hadoop supergroup         34 2025-04-15 14:31 /Lab6/test.txt
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:31 /Lab6/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hdfs dfs -ls /test_Lab6
Found 2 items
-rw-r--r--   1 hadoop supergroup         34 2025-04-15 14:26 /test_Lab6/test.txt
-rw-r--r--   1 hadoop supergroup         89 2025-04-15 14:23 /test_Lab6/text.txt
```

LAB 06:WORDCOUNT PROBLEM(HADOOP)

CODE:

#driver.java

```
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);
}
}
```

#mapper.java

```
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)
```

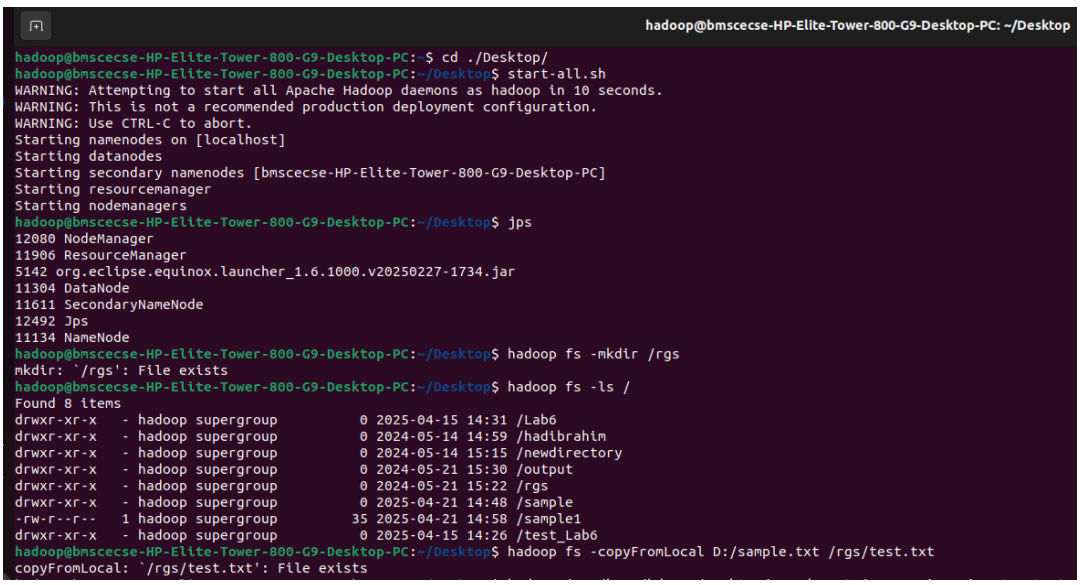
```
throws IOException
{
String line = value.toString();
for (String word : line.split(" "))
{
if (word.length() > 0)
{
output.collect(new Text(word), new IntWritable(1));
} } } }
```

#reducer.java

```
// 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));
```

OUTPUT:



```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC: ~/Desktop
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$ jps
12080 NodeManager
11906 ResourceManager
5142 org.eclipse.equinox.launcher_1.6.1000.v20250227-1734.jar
11304 DataNode
11611 SecondaryNameNode
12492 Jps
11134 NameNode
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -mkdir /rgs
mkdir: `/rgs': File exists
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /
Found 8 items
drwxr-xr-x   - hadoop supergroup          0 2025-04-15 14:31 /Lab6
drwxr-xr-x   - hadoop supergroup          0 2024-05-14 14:59 /hadibrahim
drwxr-xr-x   - hadoop supergroup          0 2024-05-14 15:15 /newdirectory
drwxr-xr-x   - hadoop supergroup          0 2024-05-21 15:30 /output
drwxr-xr-x   - hadoop supergroup          0 2024-05-21 15:22 /rgs
drwxr-xr-x   - hadoop supergroup          0 2025-04-21 14:48 /sample
-rw-r--r--   1 hadoop supergroup         35 2025-04-21 14:58 /sample1
drwxr-xr-x   - hadoop supergroup          0 2025-04-15 14:26 /test_Lab6
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -copyFromLocal D:/sample.txt /rgs/test.txt
copyFromLocal: `/rgs/test.txt': File exists
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop jar /home/hadoop/eclipse-workspace/WordCount.jar WCDriver input output
2025-05-06 14:45:31,601 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 14:45:31,636 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 14:45:31,636 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 14:45:31,695 WARN mapreduce.JobResourceUploader: No job jar file set.  User classes may not be found. See Job or Job#setJar(String).
2025-05-06 14:45:31,738 INFO input.FileInputFormat: Total input files to process : 1
2025-05-06 14:45:31,765 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 14:45:31,825 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1385456850_0001
2025-05-06 14:45:31,825 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 14:45:31,887 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 14:45:31,887 INFO mapreduce.Job: Running job: job_local1385456850_0001
2025-05-06 14:45:31,888 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 14:45:31,892 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 14:45:31,893 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 14:45:31,893 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 14:45:31,893 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-06 14:45:31,925 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 14:45:31,925 INFO mapred.LocalJobRunner: Starting task: attempt_local1385456850_0001_m_000000_0
2025-05-06 14:45:31,935 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 14:45:31,935 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 14:45:31,935 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 14:45:31,943 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
2025-05-06 14:45:31,945 INFO mapred.MapTask: Processing split: hdfs://localhost:9000/user/hadoop/input/sample.txt:0+90
2025-05-06 14:45:31,978 INFO mapred.MapTask: (EQUATOR) 0 kvi 26214396(104857584)
2025-05-06 14:45:31,978 INFO mapred.MapTask: mapreduce.task.io.sort.mb: 100
2025-05-06 14:45:31,978 INFO mapred.MapTask: soft limit at 83886080
2025-05-06 14:45:31,979 INFO mapred.MapTask: bufstart = 0; bufvoid = 104857600
2025-05-06 14:45:31,979 INFO mapred.MapTask: kvstart = 26214396; length = 6553600
2025-05-06 14:45:31,980 INFO mapred.MapTask: Map output collector class = org.apache.hadoop.mapred.MapTask$MapOutputBuffer
2025-05-06 14:45:32,049 INFO mapred.LocalJobRunner:
2025-05-06 14:45:32,050 INFO mapred.MapTask: Starting flush of map output
2025-05-06 14:45:32,050 INFO mapred.MapTask: Spilling map output
2025-05-06 14:45:32,050 INFO mapred.MapTask: bufstart = 0; bufend = 174; bufvoid = 104857600
2025-05-06 14:45:32,050 INFO mapred.MapTask: kvstart = 26214396(104857584); kvend = 26214316(104857264); length = 81/6553600
2025-05-06 14:45:32,052 INFO mapred.MapTask: Finished spill 0
2025-05-06 14:45:32,057 INFO mapred.Task: Task:attempt_local1385456850_0001_m_000000_0 is done. And is in the process of committing
2025-05-06 14:45:32,059 INFO mapred.LocalJobRunner: map
2025-05-06 14:45:32,059 INFO mapred.Task: Task 'attempt_local1385456850_0001_m_000000_0' done.
2025-05-06 14:45:32,061 INFO mapred.Task: Final Counters for attempt_local1385456850_0001_m_000000_0: Counters: 23
        File System Counters
                FILE: Number of bytes read=201
                FILE: Number of bytes written=641533
                FILE: Number of read operations=0
                FILE: Number of large read operations=0
                FILE: Number of write operations=0
                HDFS: Number of bytes read=90
                HDFS: Number of bytes written=0
                HDFS: Number of read operations=5
                HDFS: Number of large read operations=0
                HDFS: Number of write operations=1
                HDFS: Number of bytes read erasure-coded=0
        Map-Reduce Framework
                Map input records=6
```

```
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /output/
Found 2 items
-rw-r--r--   1 hadoop supergroup          0 2024-05-21 15:30 /output/_SUCCESS
-rw-r--r--   1 hadoop supergroup         69 2024-05-21 15:30 /output/part-00000
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -cat /output/part-00000
are     1
brother 1
family  1
hi      1
how     5
is      4
job     1
sister  1
you     1
your    4
```

LAB 07:WEATHER DATA(HADOOP)

CODE:

#AvgDriver.java

```
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);
```

```
}
}
```

#AvgMapper.java

```
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));
}
}
```

#AvgReducer.java

```
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));
}}
```

#MeanMaxDriver.java

```
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.java

```
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;
```

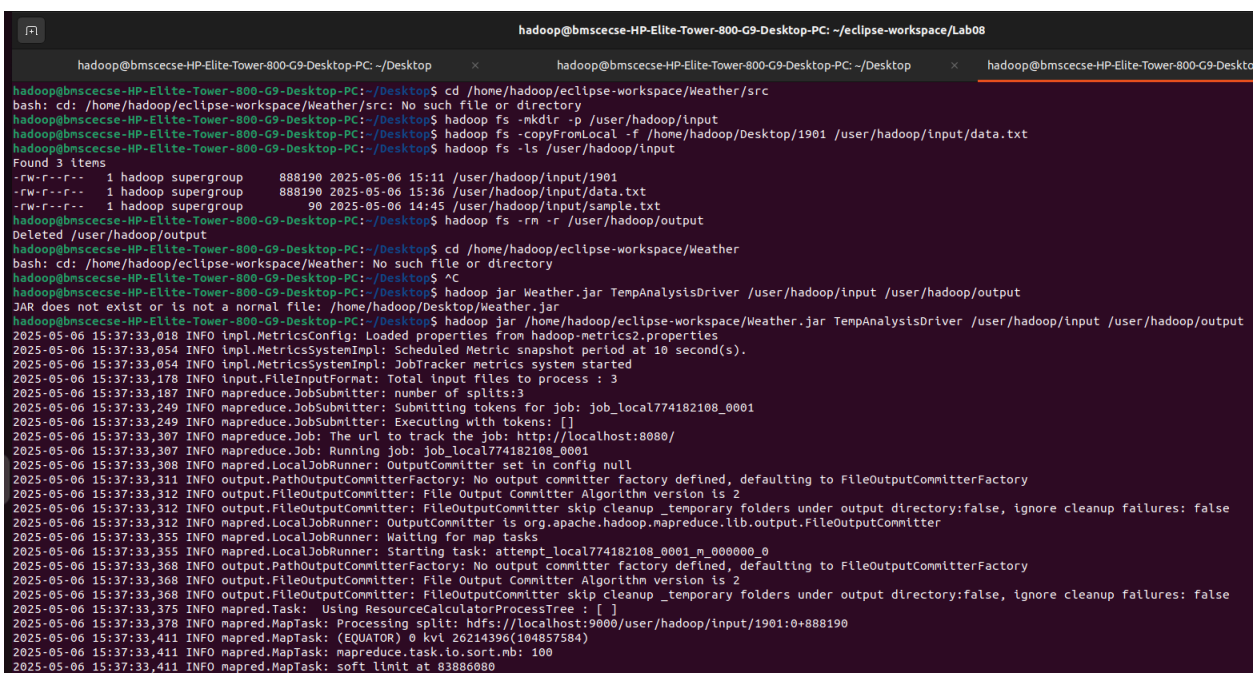
```
String line = value.toString();
String month = line.substring(19, 21);
if (line.charAt(87) == '+') {
temperature = Integer.parseInt(line.substring(88, 92));
} else {
temperature = Integer.parseInt(line.substring(87, 92));
  }
String quality = line.substring(92, 93);
if (temperature != 9999 && quality.matches("[01459]"))
context.write(new Text(month), new IntWritable(temperature));
}
}
```

#MeanMaxReducer.java

```
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();
```

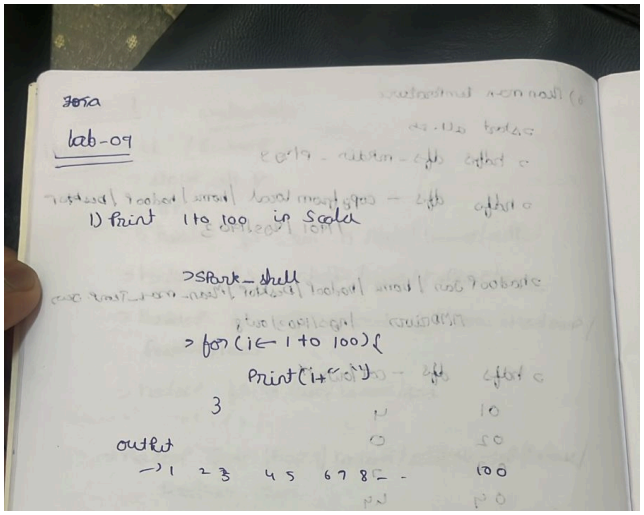
```
if (temp > max_temp)
max_temp = temp;
count++;
if (count == 3) {
total_temp += max_temp;
max_temp = 0;
count = 0;
days++;
}
}
context.write(key, new IntWritable(total_temp / days));
}
}
```

OUTPUT:

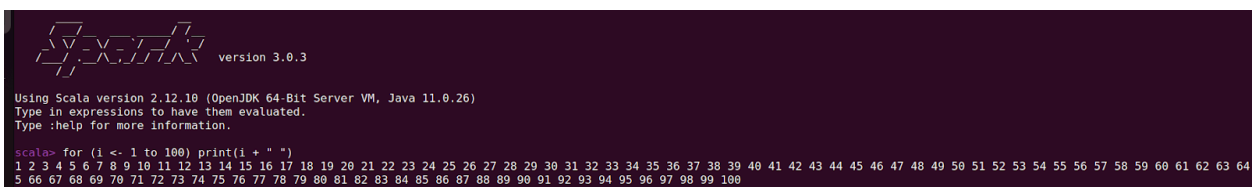


```
                Merged Map outputs=0
                GC time elapsed (ms)=0
                Total committed heap usage (bytes)=1052770304
        File Input Format Counters
                Bytes Read=1776380
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ hadoop fs -ls /user/hadoop/output
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ cd ~/eclipse-workspace/Weather/src
hadoop com.sun.tools.javac.Main *.java
jar cf Weather.jar *.class
mv Weather.jar ..
bash: cd: /home/hadoop/eclipse-workspace/Weather/src: No such file or directory
error: file not found: *.java
Usage: javac <options> <source files>
use --help for a list of possible options
*.class : no such file or directory
mv: cannot stat 'Weather.jar': No such file or directory
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/Desktop$ cd ~/eclipse-workspace/Lab08/src
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ hadoop com.sun.tools.javac.Main *.java
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ jar cf Weather.jar *.class
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ mv Weather.jar ..
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ hadoop fs -mkdir -p /user/hadoop/aaa
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ hadoop fs -copyFromLocal -f /home/hadoop/Desktop/1901 /user/hadoop/aaa/text.txt
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ hadoop fs -rm -r /user/hadoop/aaa/output
Deleted /user/hadoop/aaa/output
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08/src$ cd ~/eclipse-workspace/Lab08
hadoop@bmscecse-HP-Elite-Tower-800-G9-Desktop-PC:~/eclipse-workspace/Lab08$ hadoop jar Weather.jar TempAnalysisDriver /user/hadoop/aaa/text.txt /user/hadoop/aaa/output
2025-05-06 15:42:33,864 INFO impl.MetricsConfig: Loaded properties from hadoop-metrics2.properties
2025-05-06 15:42:33,903 INFO impl.MetricsSystemImpl: Scheduled Metric snapshot period at 10 second(s).
2025-05-06 15:42:33,903 INFO impl.MetricsSystemImpl: JobTracker metrics system started
2025-05-06 15:42:34,007 INFO input.FileInputFormat: Total input files to process : 1
2025-05-06 15:42:34,031 INFO mapreduce.JobSubmitter: number of splits:1
2025-05-06 15:42:34,097 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_local1383725974_0001
2025-05-06 15:42:34,098 INFO mapreduce.JobSubmitter: Executing with tokens: []
2025-05-06 15:42:34,152 INFO mapreduce.Job: The url to track the job: http://localhost:8080/
2025-05-06 15:42:34,153 INFO mapreduce.Job: Running job: job_local1383725974_0001
2025-05-06 15:42:34,153 INFO mapred.LocalJobRunner: OutputCommitter set in config null
2025-05-06 15:42:34,158 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 15:42:34,158 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:42:34,158 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 15:42:34,159 INFO mapred.LocalJobRunner: OutputCommitter is org.apache.hadoop.mapreduce.lib.output.FileOutputCommitter
2025-05-06 15:42:34,206 INFO mapred.LocalJobRunner: Waiting for map tasks
2025-05-06 15:42:34,207 INFO mapred.LocalJobRunner: Starting task: attempt_local1383725974_0001_m_000000_0
2025-05-06 15:42:34,220 INFO output.PathOutputCommitterFactory: No output committer factory defined, defaulting to FileOutputCommitterFactory
2025-05-06 15:42:34,220 INFO output.FileOutputCommitter: File Output Committer Algorithm version is 2
2025-05-06 15:42:34,220 INFO output.FileOutputCommitter: FileOutputCommitter skip cleanup _temporary folders under output directory:false, ignore cleanup failures: false
2025-05-06 15:42:34,227 INFO mapred.Task:  Using ResourceCalculatorProcessTree : [ ]
```

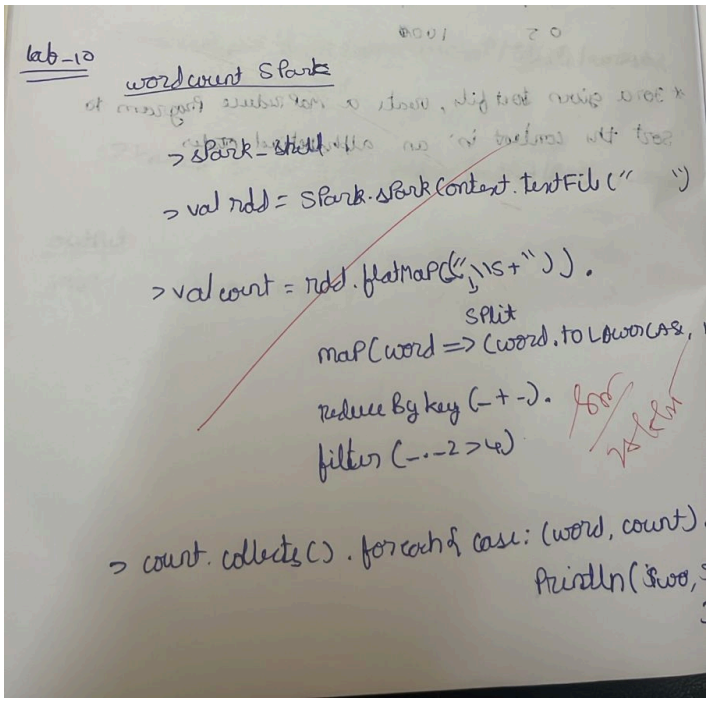
LAB 08:SCALA(PRINTING THE NUMBER)



OUTPUT:



LAB 09:SCALA SPARK(RDD AND FLATMAP)



OUTPUT:

```
bmscecse@bmscecse-HP-Elite-Tower-600-G9-Desktop-PC:~$ spark-shell
25/05/20 11:28:13 WARN Utils: Your hostname, bmscecse-HP-Elite-Tower-600-G9-Desktop-PC resolves to a loopback address: 127.0.1.1; using 10.124.3.80 instead (on interface eno1)
25/05/20 11:28:13 WARN Utils: Set SPARK_LOCAL_IP if you need to bind to another address
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.apache.spark.unsafe.Platform (file:/opt/spark/jars/spark-unsafe_2.12-3.0.3.jar) to constructor java.nio.DirectByteBuffer(long,int)
WARNING: Please consider reporting this to the maintainers of org.apache.spark.unsafe.Platform
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
25/05/20 11:28:13 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Using Spark's default log4j profile: org/apache/spark/log4j-defaults.properties
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
Spark context Web UI available at http://10.124.3.80:4040
Spark context available as 'sc' (master = local[*], app id = local-1747720695950).
Spark session available as 'spark'.
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /___/ .__/\_,_/_/ /_/\_\   version 3.0.3
      /_/

Using Scala version 2.12.10 (OpenJDK 64-Bit Server VM, Java 11.0.26)
Type in expressions to have them evaluated.
Type :help for more information.

scala> for (i <- 1 to 100) print(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 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 6
5 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
scala> val rdd = spark.sparkContext.textFile("file:/home/bmscecse/Desktop/scala")
rdd: org.apache.spark.rdd.RDD[String] = file:/home/bmscecse/Desktop/scala MapPartitionsRDD[1] at textFile at <console>:23

scala> val counts = rdd.flatMap(_.split("\\s+")).map(word => (word.toLowerCase, 1)).reduceByKey(_ + _).filter(_._2 > 4)
counts: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[5] at filter at <console>:25

scala> counts.collect().foreach{ case (word, count) => println(s"$word $count") }
spark 6
```

```
scala> val rdd = spark.sparkContext.textFile("file:/home/bmscecse/Desktop/scala")
rdd: org.apache.spark.rdd.RDD[String] = file:/home/bmscecse/Desktop/scala MapPartitionsRDD[1] at textFile at <console>:23

scala> val counts = rdd.flatMap(_.split("\\s+")).map(word => (word.toLowerCase, 1)).reduceByKey(_ + _).filter(_._2 > 4)
counts: org.apache.spark.rdd.RDD[(String, Int)] = MapPartitionsRDD[5] at filter at <console>:25

scala> counts.collect().foreach{ case (word, count) => println(s"$word $count") }
spark 6

scala>
```

LAB 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).

```
# Install NLTK and download required data (run once)

!pip install nltk


import nltk

nltk.download('punkt')

nltk.download('stopwords')

nltk.download('wordnet')


from pyspark.sql import SparkSession

from pyspark.sql.functions import col, lower, regexp_replace, split, explode, udf

from pyspark.sql.types import ArrayType, StringType

from pyspark.ml.feature import StopWordsRemover

from nltk.stem import WordNetLemmatizer


# Initialize SparkSession

spark = SparkSession.builder.appName("TextProcessing").getOrCreate()


# Define your input lines
```

```
lines = [
    "Hello, I hate you.",
    "I hate that I love you.",
    "Don't want to, but I can't put",
    "nobody else above you."
]

# Create DataFrame from lines
df = spark.createDataFrame(lines, "string").toDF("value")

# Step 1: Lowercase and remove punctuation
df_clean = df.select(regexp_replace(lower(col("value")), "[^a-zA-Z\\s]", "").alias("cleaned"))

# Step 2: Tokenize the cleaned text
df_tokens = df_clean.select(split(col("cleaned"), "\\s+").alias("tokens"))

# Step 3: Remove stop words
remover = StopWordsRemover(inputCol="tokens", outputCol="filtered")
df_filtered = remover.transform(df_tokens)

# Step 4: Lemmatization using NLTK WordNetLemmatizer with UDF
lemmatizer = WordNetLemmatizer()
```

```
def lemmatize_words(words):
    return [lemmatizer.lemmatize(word) for word in words]

lemmatize_udf = udf(lemmatize_words, ArrayType(StringType()))

df_lemmatized = df_filtered.withColumn("lemmatized", lemmatize_udf(col("filtered")))

# Step 5: Explode the lemmatized words and show results
df_lemmatized.select(explode(col("lemmatized")).alias("word")).show(truncate=False)
```

```
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  |
+------+
```