ADBMS

Assignment 1

Name: Prasad Sanjay Khalkar

Roll No: 33138

TE-09 K-09

Problem Statement:

Create a database with suitable example using MongoDB and implement:

1)Inserting and Saving document

2)Removing document

3)Updating document

4)Execute atleast 10 queries on:

a) Find and FindOne

b) Query Criteria

c) Type Specific queries

d) where queries

e) Cursors

Theory:

Insertion of Document:

1. To Create a collection

db.createCollection(“DB NAME”)

2. To Create a capped collection

db.createCollection("COLLECTION NAME", {capped:true,

size:20480})

3. To Insert a document into collection

db.CollectionName.insert({ Teacher_id: “Pic001", Teacher_Name:

“Ravi",Dept_Name: “IT”, Sal:30000, status: "A" })

4. To Update a document into collection

db.CollectionName.update({ sal: { $gt: 25000 } }, { $set: {

Dept_name: “ETC" } }, { multi: true })

5. To Remove a document from collection

db.CollectionName.remove({Teacher_id: "pic001"});

6. To Alter a field into a mongodb document

db.Teacher_info.update({ }, { $set: { join_date: new Date() } }, { multi:

true})

7. To drop a particular collection

db.CollectionName.drop()

Retrieval From Database:-

1. Retrieve a collection in mongodb using Find command

db.CollectionName.find()

2. Retrieve a document from collection in mongodb using Find

command using condition

db.CollectionName.find({sal: 25000})

3. Retrieve a document from collection in mongodb using Find

command using or operator

db.CollectionName.find({ $or: [{ status: "A" } , { sal:50000 }] })

4. Retrieve a document from collection in mongodb using Find

command using greater than , less than, greater than and equalto ,less than and equal to operator

db. CollectionName.find({ sal: { $gt: 40000 } })

5. Retrieval a value from document which contain array field

Exact Match on an Array

db.Collection.find({ tags: ['fruit', 'food', 'citrus'] })

Match an Array Element

db.Collection.find({ tags: 'fruit' })

Match a Specific Element of an Array

db.Collection.find({ 'tags.0' : 'fruit' })

6. MongoDB provides a db.collection.findOne() method as a

special case of find() that returns a single document.

7. Exclude One Field from a Result Set

db.Collection.Find({ "user_id": { $lt: 42} }, { history: 0})

8. Return Two fields and the _id Field

db.Collection.find({ "user_id": { $lt: 42} }, { "name": 1, "email": 1})

9. Return Two Fields and Exclude _id

db.records.find({ "user_id": { $lt: 42} }, { "_id": 0, "name": 1 , "email":

1})

10. Retrieve a collection in mongodb using Find command and

pretty appearance

db.<collection>.find().pretty()

11. Retrieve a document in ascending or descending order using

1 for ascending and -1 for descending from collection in

mongodb

db.Collection.find({ status: "A" }).sort({sal: -1 })

db.Collection.find().sort({ $natural: -1 }).limit (10)12. Retrieve document with a particular from collection in

mongodb

db.Collection.find().limit(2).pretty()

12. Retrieve document with a particular from collection in mongodb

db.Collection.find().limit(2).pretty()

13. Retrieve document skipping some documents from collection in mongodb

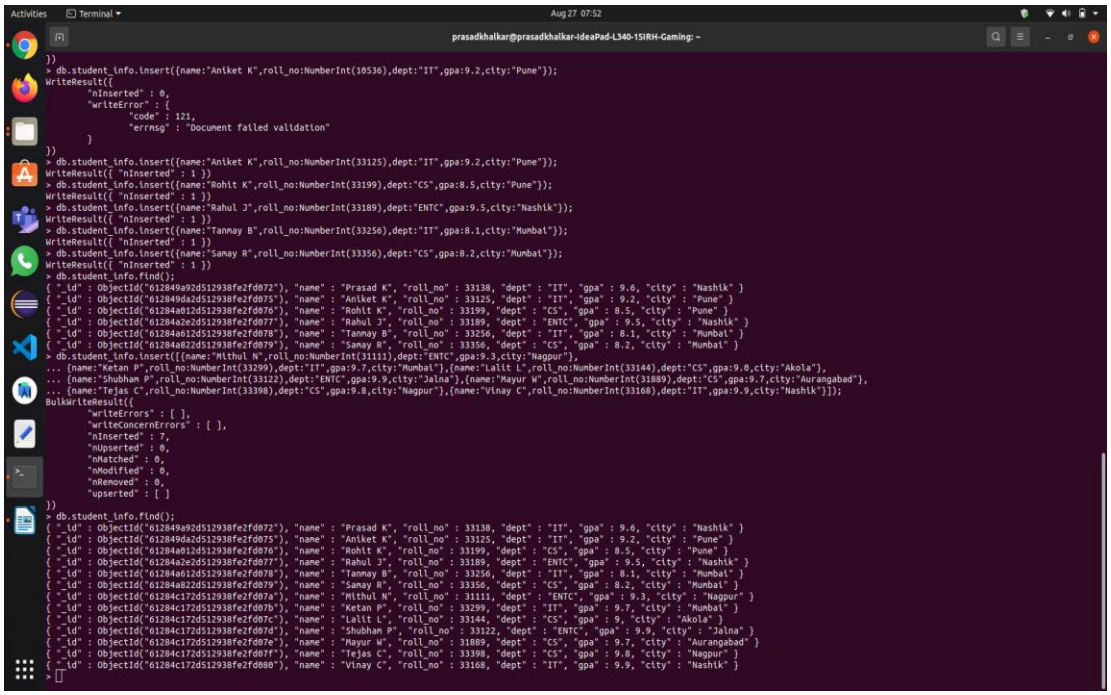
db.Collection.find().skip(3).pretty()

Implementation:

1)Inserting and Saving Document (Insert validation):

```
prasadkhalkar@prasadkhalkar-IdeaPad-L340-15IRH-Gaming:~$ sudo service mongodb start;
[sudo] password for prasadkhalkar:
prasadkhalkar@prasadkhalkar-IdeaPad-L340-15IRH-Gaming:~$ mongo
MongoDB shell version v3.6.8
connecting to: mongodb://127.0.0.1:27017
Implicit session: session { "id" : UUID("e57ed0c1-ec43-4028-85e5-cc393c5412e2") }
MongoDB server version: 3.6.8
Server has startup warnings:
2021-08-27T07:16:31.579+0530 I STORAGE  [initandlisten]
2021-08-27T07:16:31.579+0530 I STORAGE  [initandlisten] ** WARNING: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine
2021-08-27T07:16:31.579+0530 I STORAGE  [initandlisten] **          See http://dochub.mongodb.org/core/prodnotes-filesystem
2021-08-27T07:16:37.909+0530 I CONTROL  [initandlisten]
2021-08-27T07:16:37.909+0530 I CONTROL  [initandlisten] ** WARNING: Access control is not enabled for the database.
2021-08-27T07:16:37.909+0530 I CONTROL  [initandlisten] **          Read and write access to data and configuration is unrestricted.
2021-08-27T07:16:37.909+0530 I CONTROL  [initandlisten]
> show dbs;
admin             0.000GB
config            0.000GB
local             0.000GB
student_database  0.000GB
> use student_database
switched to db student_database
> show collections;
student_info
> db.student_info.drop()
true
> show collections;
> db.createCollection("student_info",{ validator: { $jsonSchema:{
... bsonType: "object", required: [ "name","roll_no","dept","gpa","city" ],
... properties: {
... name: { bsonType: "string" }, roll_no: { bsonType: "int", minimum: 31000, maximum: 33999 } } } } } );
{ "ok" : 1 }
> db.student_info.createIndex({roll_no:1},{unique:true})
{
        "createdCollectionAutomatically" : false,
        "numIndexesBefore" : 1,
        "numIndexesAfter" : 2,
        "ok" : 1
}
```

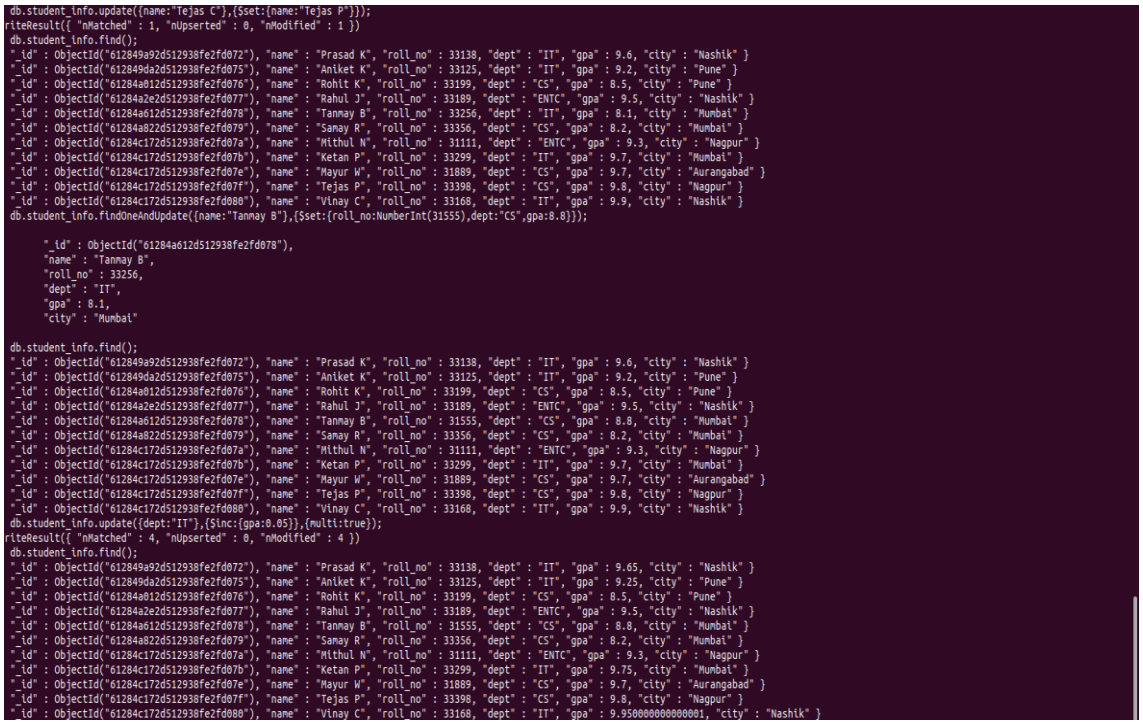
```
> db.getCollectionInfos();
[
        {
                "name" : "student_info",
                "type" : "collection",
                "options" : {
                        "validator" : {
                                "$jsonSchema" : {
                                        "bsonType" : "object",
                                        "required" : [
                                                "name",
                                                "roll_no",
                                                "dept",
                                                "gpa",
                                                "city"
                                        ],
                                        "properties" : {
                                                "name" : {
                                                        "bsonType" : "string"
                                                },
                                                "roll_no" : {
                                                        "bsonType" : "int",
                                                        "minimum" : 31000,
                                                        "maximum" : 33999
                                                }
                                        }
                                }
                        }
                },
                "info" : {
                        "readOnly" : false,
                        "uuid" : UUID("549971fd-b0ec-4c34-a85e-8db12687153f")
                },
                "idIndex" : {
                        "v" : 2,
                        "key" : {
                                "_id" : 1
                        },
                        "name" : "_id_",
                        "ns" : "student_database.student_info"
                }
        }
]
> db.student_info.insert({name:"Prasad K",roll_no:NumberInt(33138),dept:"IT",gpa:9.6,city:"Nashik"});
WriteResult({ "nInserted" : 1 })
> db.student_info.insert({name:"Aniket K",roll_no:NumberInt(33138),dept:"IT",gpa:9.2,city:"Pune"});
WriteResult({
        "nInserted" : 0,
        "writeError" : {
                "code" : 11000,
                "errmsg" : "E11000 duplicate key error collection: student_database.student_info index: roll_no_1 dup key: { : 33138 }"
        }
})
```



2) Removing document:

```
db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.6, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.2, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 33256, "dept" : "IT", "gpa" : 8.1, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.7, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07c"), "name" : "Lalit L", "roll_no" : 33144, "dept" : "CS", "gpa" : 9, "city" : "Akola" }
{ "_id" : ObjectId("61284c172d512938fe2fd07d"), "name" : "Shubham P", "roll_no" : 33122, "dept" : "ENTC", "gpa" : 9.9, "city" : "Jalna" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas C", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.9, "city" : "Nashik" }
db.student_info.deleteOne({roll_no:33144});
"acknowledged" : true, "deletedCount" : 1 }
db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.6, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.2, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 33256, "dept" : "IT", "gpa" : 8.1, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.7, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07d"), "name" : "Shubham P", "roll_no" : 33122, "dept" : "ENTC", "gpa" : 9.9, "city" : "Jalna" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas C", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.9, "city" : "Nashik" }
db.student_info.remove({roll_no:33122});
riteResult({ "nRemoved" : 1 })
db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.6, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.2, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 33256, "dept" : "IT", "gpa" : 8.1, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.7, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas C", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.9, "city" : "Nashik" }
```

3) Updating document (document replacement, using modifiers, up inserts, updating multiple documents, returning updated documents):



```
db.student_info.update({name:"Tejas C"},{$set:{name:"Tejas P"}});
riteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.6, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.2, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 33256, "dept" : "IT", "gpa" : 8.1, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.7, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.9, "city" : "Nashik" }
db.student_info.findOneAndUpdate({name:"Tanmay B"},{$set:{roll_no:NumberInt(31555),dept:"CS",gpa:8.8}});

        "_id" : ObjectId("61284a612d512938fe2fd078"),
        "name" : "Tanmay B",
        "roll_no" : 33256,
        "dept" : "IT",
        "gpa" : 8.1,
        "city" : "Mumbai"

db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.6, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.2, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.7, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.9, "city" : "Nashik" }
db.student_info.update({dept:"IT"},{$inc:{gpa:0.05}},{multi:true});
riteResult({ "nMatched" : 4, "nUpserted" : 0, "nModified" : 4 })
db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.950000000000001, "city" : "Nashik" }
```

```
> db.student_info.findAndModify({query:{name:"Lalit L"}, update:{$set:{roll_no:NumberInt(33322),dept:"IT",gpa:9.1,city:"Nashik"}},upsert:true});
null
> db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.950000000000001, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.update({roll_no:33356},{$min:{gpa:8.5}},{multi:true}));
2021-08-27T09:15:55.047+0530 E QUERY    [thread1] SyntaxError: missing ) after argument list @(shell):1:68
> db.student_info.update({roll_no:33356},{$min:{gpa:8.5}},{multi:true});
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 0 })
> db.student_info.update({roll_no:33168},{$max:{gpa:9.93}},{multi:true});
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 0 })
> db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.2, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.950000000000001, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.update({roll_no:33356},{$max:{gpa:8.5}},{multi:true});
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.student_info.update({roll_no:33168},{$min:{gpa:9.93}},{multi:true});
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
>
```

4) Execute atleast 10 queries on any suitable MongoDB database that demonstrates following:

a)Find and FindOne (specific values):

```
> db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({gpa:{$gt:8.99}});
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({gpa:{$lt:9.0}});
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
> db.student_info.findOne();
{
        "_id" : ObjectId("612849a92d512938fe2fd072"),
        "name" : "Prasad K",
        "roll_no" : 33138,
        "dept" : "IT",
        "gpa" : 9.65,
        "city" : "Nashik"
}
> db.student_info.findOne({roll_no:31111});
{
        "_id" : ObjectId("61284c172d512938fe2fd07a"),
        "name" : "Mithul N",
        "roll_no" : 31111,
        "dept" : "ENTC",
        "gpa" : 9.3,
        "city" : "Nagpur"
}
> db.student_info.findOne({gpa:9.75,dept:"IT"});
{
        "_id" : ObjectId("61284c172d512938fe2fd07b"),
        "name" : "Ketan P",
        "roll_no" : 33299,
        "dept" : "IT",
        "gpa" : 9.75,
        "city" : "Mumbai"
}
```

b) Query criteria(Query conditionals, OR queries, $not, Conditional semantics):

```
> db.student_info.find({ $or:[{gpa:{$gte:9.0}},{dept:"IT"}] });
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({gpa:{$not:{$lt:9.4}}});
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
> db.student_info.find({dept:{$not:{$in:["ENTC","CS"]}}});
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({dept:{$not:{$eq:"IT"}}});
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
>
```

c) Type specific queries

i) Null and Regex (regular expressions):

```
> db.createCollection("student_work");
{ "ok" : 1 }
> db.student_work.insert({name:"Rohit K",expertise:"Frontend Developer",work:["Web","Android"]});
WriteResult({ "nInserted" : 1 })
> db.student_work.insert({name:"Kartik A",expertise:"Backend Developer",work:["Web","Android"]});
WriteResult({ "nInserted" : 1 })
> db.student_work.insert({name:"Rahul J",expertise:"IT Engineer",work:["Web"]});
WriteResult({ "nInserted" : 1 })
> db.student_work.insert({name:"Rahul J",expertise:"CS Engineer",work:["Android"]});
WriteResult({ "nInserted" : 1 })
> db.student_work.insert({name:"Pushkar J",expertise:"CS Engineer",work:["Android"]});
WriteResult({ "nInserted" : 1 })
> db.student_work.insert({name:"Tushar J",work:["Android","AI"]});
WriteResult({ "nInserted" : 1 })
> db.student_work.find({expertise:null}).pretty();
{
        "_id" : ObjectId("61286e232d512938fe2fd08a"),
        "name" : "Tushar J",
        "work" : [
                "Android",
                "AI"
        ]
}
> db.student_work.find({expertise:{$regex:"Developer"}});
{ "_id" : ObjectId("61286dba2d512938fe2fd085"), "name" : "Rohit K", "expertise" : "Frontend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286dd32d512938fe2fd086"), "name" : "Kartik A", "expertise" : "Backend Developer", "work" : [ "Web", "Android" ] }
> db.student_work.find({expertise:{$regex:"Engineer"}});
{ "_id" : ObjectId("61286deb2d512938fe2fd087"), "name" : "Rahul J", "expertise" : "IT Engineer", "work" : [ "Web" ] }
{ "_id" : ObjectId("61286df52d512938fe2fd088"), "name" : "Rahul J", "expertise" : "CS Engineer", "work" : [ "Android" ] }
{ "_id" : ObjectId("61286dff2d512938fe2fd089"), "name" : "Pushkar J", "expertise" : "CS Engineer", "work" : [ "Android" ] }
> db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({name:{$regex:"^R"}});
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
> db.student_info.find({name:{$regex:"^M"}});
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
```

ii) Querying arrays:

```
> db.student_work.find();
{ "_id" : ObjectId("61286dba2d512938fe2fd085"), "name" : "Rohit K", "expertise" : "Frontend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286dd32d512938fe2fd086"), "name" : "Kartik A", "expertise" : "Backend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286deb2d512938fe2fd087"), "name" : "Rahul J", "expertise" : "IT Engineer", "work" : [ "Web" ] }
{ "_id" : ObjectId("61286df52d512938fe2fd088"), "name" : "Rahul J", "expertise" : "CS Engineer", "work" : [ "Android" ] }
{ "_id" : ObjectId("61286dff2d512938fe2fd089"), "name" : "Pushkar J", "expertise" : "CS Engineer", "work" : [ "Android" ] }
{ "_id" : ObjectId("61286e232d512938fe2fd08a"), "name" : "Tushar J", "work" : [ "Android", "AI" ] }
> db.student_work.find({"work":{$size:2}});
{ "_id" : ObjectId("61286dba2d512938fe2fd085"), "name" : "Rohit K", "expertise" : "Frontend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286dd32d512938fe2fd086"), "name" : "Kartik A", "expertise" : "Backend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286e232d512938fe2fd08a"), "name" : "Tushar J", "work" : [ "Android", "AI" ] }
> db.student_work.find({ work: "Android"});
{ "_id" : ObjectId("61286dba2d512938fe2fd085"), "name" : "Rohit K", "expertise" : "Frontend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286dd32d512938fe2fd086"), "name" : "Kartik A", "expertise" : "Backend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286df52d512938fe2fd088"), "name" : "Rahul J", "expertise" : "CS Engineer", "work" : [ "Android" ] }
{ "_id" : ObjectId("61286dff2d512938fe2fd089"), "name" : "Pushkar J", "expertise" : "CS Engineer", "work" : [ "Android" ] }
{ "_id" : ObjectId("61286e232d512938fe2fd08a"), "name" : "Tushar J", "work" : [ "Android", "AI" ] }
> db.student_work.find({ work:{$all:["Android","Web"]}});
{ "_id" : ObjectId("61286dba2d512938fe2fd085"), "name" : "Rohit K", "expertise" : "Frontend Developer", "work" : [ "Web", "Android" ] }
{ "_id" : ObjectId("61286dd32d512938fe2fd086"), "name" : "Kartik A", "expertise" : "Backend Developer", "work" : [ "Web", "Android" ] }
>
```

d) where queries:

```
> db.student_info.find();
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({$where: function() {return (this.city == "Nashik" && this.dept == "IT")}});
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({$where: function() {return (this.city == "Nashik" && (this.dept == "IT" || this.dept=="CS") && this.gpa>=9.00)}});
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find({$where: function() {return (this.city == "Nashik" && (this.dept == "IT" || this.dept=="ENTC") && this.gpa>=9.00)}});
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
>
```

e) Cursors (Limit, skip, sort):

```
> db.student_info.find().sort({roll_no:1});
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
> db.student_info.find().sort({gpa:1});
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a822d512938fe2fd079"), "name" : "Samay R", "roll_no" : 33356, "dept" : "CS", "gpa" : 8.5, "city" : "Mumbai" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284c172d512938fe2fd07a"), "name" : "Mithul N", "roll_no" : 31111, "dept" : "ENTC", "gpa" : 9.3, "city" : "Nagpur" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
> db.student_info.find().skip(7);
{ "_id" : ObjectId("61284c172d512938fe2fd07b"), "name" : "Ketan P", "roll_no" : 33299, "dept" : "IT", "gpa" : 9.75, "city" : "Mumbai" }
{ "_id" : ObjectId("61284c172d512938fe2fd07e"), "name" : "Mayur W", "roll_no" : 31889, "dept" : "CS", "gpa" : 9.7, "city" : "Aurangabad" }
{ "_id" : ObjectId("61284c172d512938fe2fd07f"), "name" : "Tejas P", "roll_no" : 33398, "dept" : "CS", "gpa" : 9.8, "city" : "Nagpur" }
{ "_id" : ObjectId("61284c172d512938fe2fd080"), "name" : "Vinay C", "roll_no" : 33168, "dept" : "IT", "gpa" : 9.93, "city" : "Nashik" }
{ "_id" : ObjectId("61285f54c23b033c00ab042b"), "name" : "Lalit L", "city" : "Nashik", "dept" : "IT", "gpa" : 9.1, "roll_no" : 33322 }
> db.student_info.find().limit(5);
{ "_id" : ObjectId("612849a92d512938fe2fd072"), "name" : "Prasad K", "roll_no" : 33138, "dept" : "IT", "gpa" : 9.65, "city" : "Nashik" }
{ "_id" : ObjectId("612849da2d512938fe2fd075"), "name" : "Aniket K", "roll_no" : 33125, "dept" : "IT", "gpa" : 9.25, "city" : "Pune" }
{ "_id" : ObjectId("61284a012d512938fe2fd076"), "name" : "Rohit K", "roll_no" : 33199, "dept" : "CS", "gpa" : 8.5, "city" : "Pune" }
{ "_id" : ObjectId("61284a2e2d512938fe2fd077"), "name" : "Rahul J", "roll_no" : 33189, "dept" : "ENTC", "gpa" : 9.5, "city" : "Nashik" }
{ "_id" : ObjectId("61284a612d512938fe2fd078"), "name" : "Tanmay B", "roll_no" : 31555, "dept" : "CS", "gpa" : 8.8, "city" : "Mumbai" }
>
```

Conclusion:

Understood and implemented the insert delete update and other query operations.

Assignment-2
Map Reduce and Aggregate
ADBMSL

Name: Prasad Sanjay Khalkar
Roll No: 33138
TE-09 L-09
Problem Statement: Implement Map-reduce and aggregation, indexing with suitable example in MongoDB. Demonstrate the following: • Aggregation framework • Create and drop different types of indexes and explain() to show the advantage of the indexes

Theory:

MapReduce:
In MongoDB, map-reduce operations use custom JavaScript functions to map, or associate, values to a key. If a key has multiple values mapped to it, the operation reduces the values for the key to a single object.

Characteristics:
● Support non-sharded and sharded input collections.
● Can be used for incremental aggregation over large collections.
● Returns result set inline.
● Supports non-sharded and shardedinput collections.
● Uses a "pipeline" approach where objects are transformed as they pass
through a series of pipeline operators such as matching, projecting, sorting,andgrouping.

MapReduce uses the two following steps:
1) Map Function:
    ● var mapFunction1 = function()
    ● { emit(this.cust_id, this.amount);};
2) Reduce Function:
    ● var reduceFunction1 = function(key, values)
    ● {return Array.sum(values); };

Aggregation:
Aggregation operations process multiple documents and return computed results. You can use aggregation operations to:

- Group values from multiple documents together.
- Perform operations on the grouped data to return a single result.
- Analyze data changes over time.

Indexing:
Indexes are special data structures [1] that store a small portion of the collection's data set in an easy to traverse form. The index stores the value of a specific field or set of fields, ordered by the value of the field. The ordering of the index entries supports efficient equality matches and range-based query operations. In addition, MongoDB can return sorted results by using the ordering in the index.

Explain():
The explain command provides information on the execution of the following commands: aggregate, count, distinct, find, findAndModify, delete, mapReduce, and update.

Syntax:
{
explain: <command>,
verbosity: <string>,
comment: <any>
}

Implementation:
Map Reduce:

Database and the collection for the example:
The collection schema consists the ID of book, Book Name, Author Name and the status whether it is active or not.

```
> use book_database;
switched to db book_database
> db.createCollection("book_details",{ validator: { $jsonSchema:{
... bsonType:"object", required: ["bookID","bookName","authorName","status"],
... properties:{ bookID:{bsonType:"int"}, bookName:{bsonType:"string"},authorName:{bsonType:"string"},status:{bsonType:"string"} } } } } );
{ "ok" : 1 }
> db.book_details.insert({bookID:101,bookName:"Bisarjan",authorName:"R.N.Tagore",status:"Active"});
WriteResult({
        "nInserted" : 0,
        "writeError" : {
                "code" : 121,
                "errmsg" : "Document failed validation"
        }
})
> db.book_details.insert({bookID:NumberInt(101),bookName:"Bisarjan",authorName:"R.N.Tagore",status:"Active"});
WriteResult({ "nInserted" : 1 })
> db.book_details.insert({bookID:NumberInt(105),bookName:"The Merchant of Venice",authorName:"Shakespeare",status:"Active"});
WriteResult({ "nInserted" : 1 })
> db.book_details.insert({bookID:NumberInt(102),bookName:"Antony and Cleopatra",authorName:"Shakespeare",status:"Active"});
WriteResult({ "nInserted" : 1 })
> db.book_details.insert({bookID:NumberInt(111),bookName:"Geetanjali",authorName:"R.N.Tagore",status:"Active"});
WriteResult({ "nInserted" : 1 })
> db.book_details.insert({bookID:NumberInt(113),bookName:"Chitra",authorName:"R.N.Tagore",status:"Inactive"});
WriteResult({ "nInserted" : 1 })
> db.book_details.insert({bookID:NumberInt(123),bookName:"Origin of Species",authorName:"Charles Darwin",status:"Active"});
WriteResult({ "nInserted" : 1 })
```

The documents inserted in the collection:

```
> db.book_details.find();
{ "_id" : ObjectId("6163c5275daaad5e753eee55"), "bookID" : 101, "bookName" : "Bisarjan", "authorName" : "R.N.Tagore", "status" : "Active" }
{ "_id" : ObjectId("6163c5595daaad5e753eee56"), "bookID" : 105, "bookName" : "The Merchant of Venice", "authorName" : "Shakespeare", "status" : "Active" }
{ "_id" : ObjectId("6163c6005daaad5e753eee57"), "bookID" : 102, "bookName" : "Antony and Cleopatra", "authorName" : "Shakespeare", "status" : "Active" }
{ "_id" : ObjectId("6163c61a5daaad5e753eee58"), "bookID" : 111, "bookName" : "Geetanjali", "authorName" : "R.N.Tagore", "status" : "Active" }
{ "_id" : ObjectId("6163c63a5daaad5e753eee59"), "bookID" : 113, "bookName" : "Chitra", "authorName" : "R.N.Tagore", "status" : "Inactive" }
{ "_id" : ObjectId("6163c65d5daaad5e753eee5a"), "bookID" : 123, "bookName" : "Origin of Species", "authorName" : "Charles Darwin", "status" : "Active" }
{ "_id" : ObjectId("6163c6775daaad5e753eee5b"), "bookID" : 109, "bookName" : "Shakuntala", "authorName" : "Kalidas", "status" : "Active" }
{ "_id" : ObjectId("6163c6915daaad5e753eee5c"), "bookID" : 155, "bookName" : "Raghuvamsa", "authorName" : "Kalidas", "status" : "Active" }
{ "_id" : ObjectId("6163c6ae5daaad5e753eee5d"), "bookID" : 187, "bookName" : "Avigyan Sakuntalam", "authorName" : "Kalidas", "status" : "Inactive" }
{ "_id" : ObjectId("6163c6df5daaad5e753eee5e"), "bookID" : 199, "bookName" : "Time Machine", "authorName" : "H.G.Wells", "status" : "Active" }
{ "_id" : ObjectId("6163c70b5daaad5e753eee5f"), "bookID" : 148, "bookName" : "A tale of two cities", "authorName" : "Charles Dickens", "status" : "Active" }
{ "_id" : ObjectId("6163c73b5daaad5e753eee60"), "bookID" : 158, "bookName" : "David Copperfield", "authorName" : "Charles Dickens", "status" : "Inactive" }
```

The mapReduce function gives us a collection which tells us the active number of books for each author:

```
> var mapFunction1 = function(){ emit(this.authorName,1);}
> var reduceFunction1 = function(name,count){return Array.sum(count);};
> db.book_details.mapReduce(
... mapFunction1,
... reduceFunction1,
... { query:{status:"Active"}, out:"author_info" })
{
        "result" : "author_info",
        "timeMillis" : 973,
        "counts" : {
                "input" : 9,
                "emit" : 9,
                "reduce" : 3,
                "output" : 6
        },
        "ok" : 1
}
> db.author_info.find();
{ "_id" : "Charles Darwin", "value" : 1 }
{ "_id" : "Charles Dickens", "value" : 1 }
{ "_id" : "H.G.Wells", "value" : 1 }
{ "_id" : "Kalidas", "value" : 2 }
{ "_id" : "R.N.Tagore", "value" : 2 }
{ "_id" : "Shakespeare", "value" : 2 }
> show collections;
author_info
book_details
>
```

Aggregate:

The collection for this example consists of information related to students such as name, email ID, phone No, marks of 3 subject(Maths, ADBMS, ML) and div:

```
> db.students.find();
{ "_id" : ObjectId("6170e4dc6826486654664f0c"), "name" : "Prasad K", "emailID" : "prasadk@gmail.com", "phoneNo" : 1472583960, "marks" : { "maths" : 99, "ADBMS" : 95, "ML" : 97 }, "div" : 9 }
{ "_id" : ObjectId("6170e51768264866546 64f0d"), "name" : "Rohit K", "emailID" : "rohitk@gmail.com", "phoneNo" : 1478523690, "marks" : { "maths" : 98, "ADBMS" : 92, "ML" : 94 }, "div" : 10 }
{ "_id" : ObjectId("6170e53f6826486654664f0e"), "name" : "Tanmay B", "emailID" : "tanmayb@gmail.com", "phoneNo" : 1286608618, "marks" : { "maths" : 99, "ADBMS" : 99, "ML" : 99 }, "div" : 11 }
{ "_id" : ObjectId("6170e56f6826486654664f0f"), "name" : "Rahul J", "emailID" : "rahulj@gmail.com", "phoneNo" : 1478523690, "marks" : { "maths" : 94, "ADBMS" : 92, "ML" : 90 }, "div" : 9 }
{ "_id" : ObjectId("6170e59668264866546 64f10"), "name" : "Samay R", "emailID" : "samayr@gmail.com", "phoneNo" : 1048592818, "marks" : { "maths" : 97, "ADBMS" : 92, "ML" : 93 }, "div" : 10 }
{ "_id" : ObjectId("6170e5c26826486654664f11"), "name" : "Mithul N", "emailID" : "mithuln@gmail.com", "phoneNo" : 1478523690, "marks" : { "maths" : 97, "ADBMS" : 98, "ML" : 96 }, "div" : 11 }
{ "_id" : ObjectId("6170e5ec6826486654664f12"), "name" : "Lalit L", "emailID" : "lalitl@gmail.com", "phoneNo" : 1597534862, "marks" : { "maths" : 97, "ADBMS" : 91, "ML" : 90 }, "div" : 9 }
> db.students.find().pretty();
{
        "_id" : ObjectId("6170e4dc6826486654664f0c"),
        "name" : "Prasad K",
        "emailID" : "prasadk@gmail.com",
        "phoneNo" : 1472583960,
        "marks" : {
                "maths" : 99,
                "ADBMS" : 95,
                "ML" : 97
        },
        "div" : 9
}
{
        "_id" : ObjectId("6170e51768264866546 64f0d"),
        "name" : "Rohit K",
        "emailID" : "rohitk@gmail.com",
        "phoneNo" : 1478523690,
        "marks" : {
                "maths" : 98,
                "ADBMS" : 92,
                "ML" : 94
        },
        "div" : 10
}
```

Using aggregate function for finding totalMarks and averageMarks of each student:

```
> db.students.aggregate( {$addFields:{ totalMarks: {$add:["$marks.maths","$marks.ADBMS","$marks.ML"]}, avgMarks:{$avg:["$marks.maths","$marks.ADBMS","$marks.ML"]} } } ).pretty();
{
        "_id" : ObjectId("6170e4dc6826486654664f0c"),
        "name" : "Prasad K",
        "emailID" : "prasadk@gmail.com",
        "phoneNo" : 1472583960,
        "marks" : {
                "maths" : 99,
                "ADBMS" : 95,
                "ML" : 97
        },
        "div" : 9,
        "totalMarks" : 291,
        "avgMarks" : 97
}
{
        "_id" : ObjectId("6170e5176826486654664f0d"),
        "name" : "Rohit K",
        "emailID" : "rohitk@gmail.com",
        "phoneNo" : 1478523690,
        "marks" : {
                "maths" : 98,
                "ADBMS" : 92,
                "ML" : 94
        },
        "div" : 10,
        "totalMarks" : 284,
        "avgMarks" : 94.66666666666667
}
{
        "_id" : ObjectId("6170e53f6826486654664f0e"),
        "name" : "Tanmay B",
        "emailID" : "tanmayb@gmail.com",
        "phoneNo" : 1286608618,
        "marks" : {
                "maths" : 99,
                "ADBMS" : 99,
                "ML" : 99
        },
        "div" : 11,
        "totalMarks" : 297,
        "avgMarks" : 99
}
```

Using aggregate function for finding:

1) All the Students who have TotalMarks > 285

2) All the Students who have TotalMarks < 285

3) Average Marks for each division

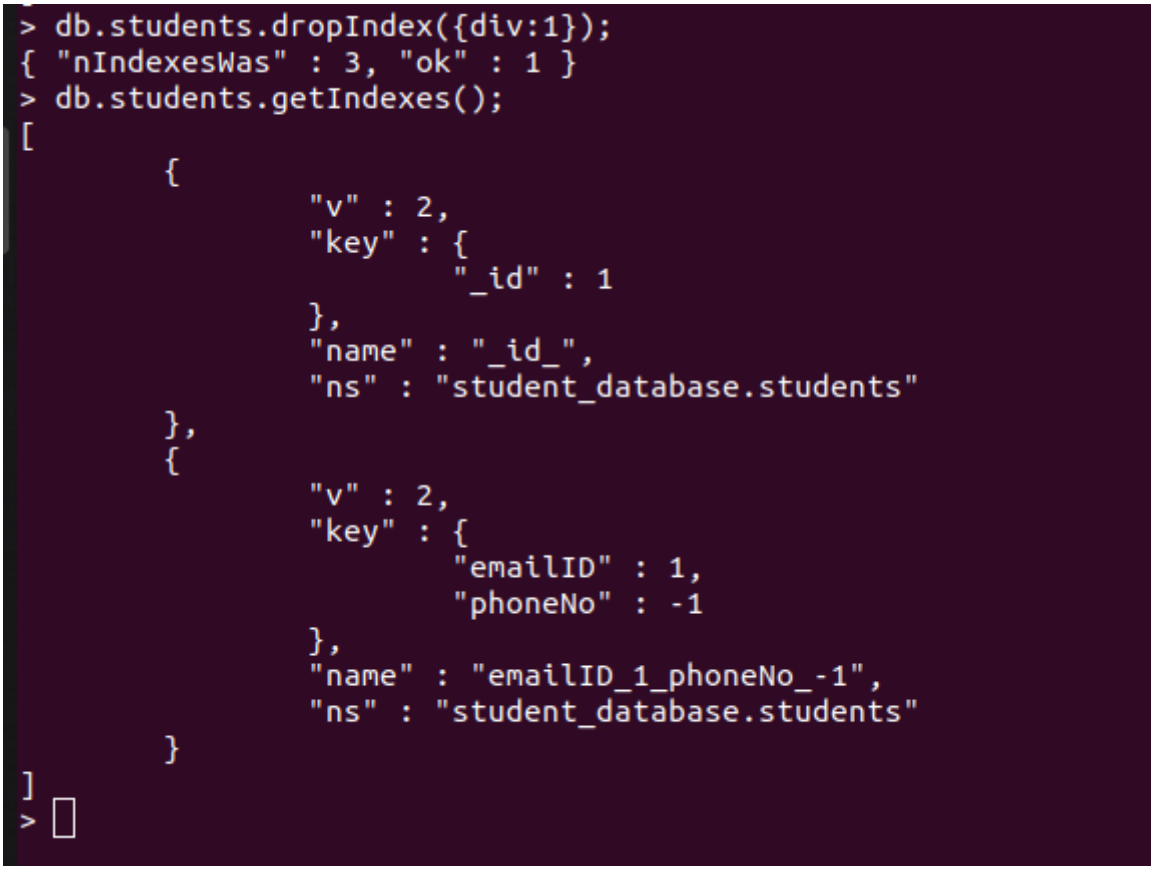
```
> db.students.aggregate( {$addFields:{ totalMarks: {$add:["$marks.maths","$marks.ADBMS","$marks.ML"]} }}, { $group: {_id:"$name", total:{$sum:"$totalMarks"} } }, {$sort:{total:1}}, {$match:{total:{$gte:2
85}}}});
{ "_id" : "Mithul N", "total" : 291 }
{ "_id" : "Prasad K", "total" : 291 }
{ "_id" : "Tanmay B", "total" : 297 }
> db.students.aggregate( {$addFields:{ totalMarks: {$add:["$marks.maths","$marks.ADBMS","$marks.ML"]} }}, { $group: {_id:"$name", total:{$sum:"$totalMarks"} } }, {$sort:{total:1}}, {$match:{total:{$lte:2
85}}}});
{ "_id" : "Rahul J", "total" : 276 }
{ "_id" : "Lalit L", "total" : 278 }
{ "_id" : "Samay R", "total" : 282 }
{ "_id" : "Rohit K", "total" : 284 }
> db.students.aggregate( {$addFields:{ avgMarks: {$avg:["$marks.maths","$marks.ADBMS","$marks.ML"]} }}, { $group: {_id:"$div", total:{$avg:"$avgMarks"} } }, {$sort:{total:1}});
{ "_id" : 9, "total" : 93.8888888888889 }
{ "_id" : 10, "total" : 94.33333333333334 }
{ "_id" : 11, "total" : 98 }
>
```

Indexing:

Creating Index:

```
> db.students.createIndex({div:1});
{
        "createdCollectionAutomatically" : false,
        "numIndexesBefore" : 1,
        "numIndexesAfter" : 2,
        "ok" : 1
}
> db.students.createIndex({emailID:1, phoneNo:-1});
{
        "createdCollectionAutomatically" : false,
        "numIndexesBefore" : 2,
        "numIndexesAfter" : 3,
        "ok" : 1
}
> db.students.getIndexes();
[
        {
                "v" : 2,
                "key" : {
                        "_id" : 1
                },
                "name" : "_id_",
                "ns" : "student_database.students"
        },
        {
                "v" : 2,
                "key" : {
                        "div" : 1
                },
                "name" : "div_1",
                "ns" : "student_database.students"
        },
        {
                "v" : 2,
                "key" : {
                        "emailID" : 1,
                        "phoneNo" : -1
                },
                "name" : "emailID_1_phoneNo_-1",
                "ns" : "student_database.students"
        }
]
```

Dropping Index:



Conclusion:
Understood and implemented MapReduce, Aggregate and Indexing operations.

ASSIGNMENT-3
CASE STUDY
ADBMSL

Name: Prasad Sanjay Khalkar
Roll No: 33138
TE-09 L-09
Problem Statement: Design conceptual model using Star and Snowflake schema for any one database.

Database:
Employee Database

Fact Table:
A fact table is a primary table in a dimensional model.
A Fact Table contains:

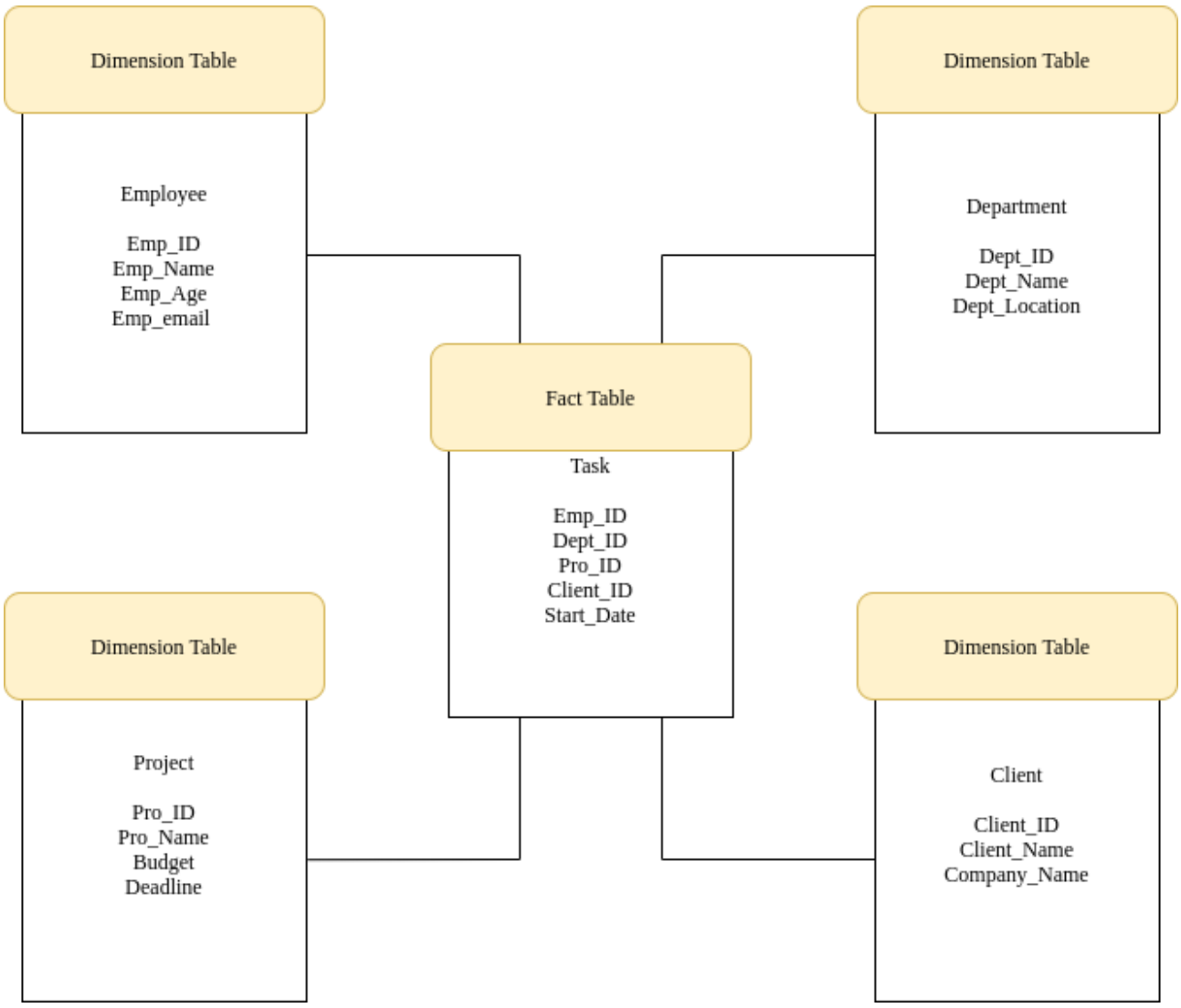
- Measurements/facts
- Foreign key to dimension table

Dimension Table:
A dimension table contains dimensions of a fact.

- They are joined to fact table via a foreign key.
- Dimension tables are de-normalized tables.
- The Dimension Attributes are the various columns in a dimension table
- Dimensions offers descriptive characteristics of the facts with the help of their attributes
- No set limit set for given for number of dimensions
- The dimension can also contain one or more hierarchical relationships

Star Schema:
This schema is widely used to develop or build a data warehouse and dimensional data marts. It includes one or more fact tables indexing any number of dimensional tables. The star schema is a necessary cause of the snowflake schema. It is also efficient for handling basic queries.

It is said to be star as its physical model resembles to the star shape having a fact table at its center and the dimension tables at its peripheral representing the star's points



In this example, the fact table is Task i.e the task or projects allocated to each employee and to which client these projects belong and to which department this project and the employee belongs

Employee Dimension Table consists of ID, Name, Age, email
Department Dimension Table consists of ID, Name, Location
Project Dimension Table consists of ID, Name, Budget, Deadline
Client Dimension Table consists of ID, Name, CompanyName

The Task Fact table consists of the Emp_ID, Dept_ID,Project_ID,Client_ID and startDate.

SnowFlake Schema:

The snowflake schema is a variant of the star schema. Here, the centralized fact table is connected to multiple dimensions. In the snowflake schema, dimensions are present in a normalized form in multiple related tables. The snowflake structure materialized when the dimensions of a star schema are detailed and highly structured, having several levels of relationship, and the child tables have multiple parent tables. The snowflake effect affects only the dimension tables and does not affect the fact tables.

Example:

The same example as of Star Schema is taken to see how SnowFlake Schema works if more and more attributes are added to the Dimension Tables.

The Task Fact table is same as of the Star Schema.

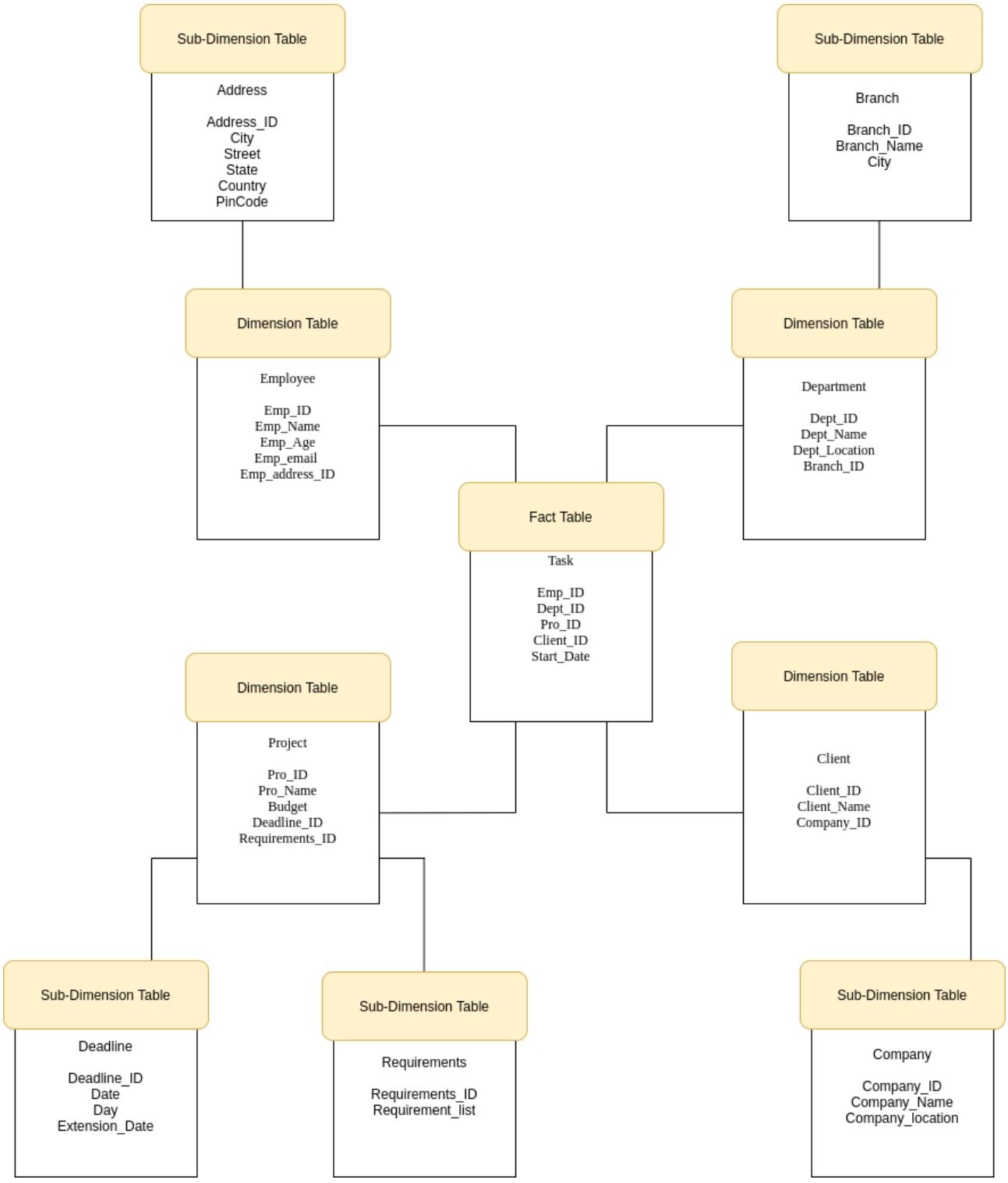
The Employee Dimension Table consists of a sub-dimensional table as Address i.e. the address of the employee(city, street, state, country, pincode, etc)

The Department Dimension Table consist of a sub-dimensional table as Branch i.e. the BranchName, City, etc.

The Client Dimension Table consist of a sub-dimensional table as Company i.e. CompanyName, Location, etc

The Project Dimension Table consist of 2 sub-dimensional table as follows:
1) Deadline, which consists of date, day of the deadline and the extensionDate if any
2) Requirements, which consists of list of requirements provided by the client for this project

This shows how SnowFlake Schema normalises the denormalised data in Star Schema when more complex, multi dimensional attributes are added to the tables, and how it speeds up the processes.


Sub-Dimension Table
Address
Address_ID
City
Street
State
Country
PinCode
Sub-Dimension Table
Branch
Branch_ID
Branch_Name
City
Dimension Table
Employee
Emp_ID
Emp_Name
Emp_Age
Emp_email
Emp_address_ID
Dimension Table
Department
Dept_ID
Dept_Name
Dept_Location
Branch_ID
Fact Table
Task
Emp_ID
Dept_ID
Pro_ID
Client_ID
Start_Date
Dimension Table
Project
Pro_ID
Pro_Name
Budget
Deadline_ID
Requirements_ID
Dimension Table
Client
Client_ID
Client_Name
Company_ID
Sub-Dimension Table
Deadline
Deadline_ID
Date
Day
Extension_Date
Sub-Dimension Table
Requirements
Requirements_ID
Requirement_list
Sub-Dimension Table
Company
Company_ID
Company_Name
Company_location

Comparison Between Star and Snowflake Schema:

S.NO	Star Schema	Snowflake Schema
1.	Star schema is a top-down model.	While it is a bottom-up model.
2.	Star schema uses more space.	While it uses less space.
3.	In star schema, Normalization is not used.	While in this, Both normalization and denormalization are used.
4.	It's design is very simple.	While it's design is complex.
5.	Queries performance is good as there is less number of joins involved.	The performance of queries is a bit less when compared to star schema as more number of joins are involved.
6.	It takes more disk space.	It takes less disk space.
7.	It has less number of foreign keys.	While it has more number of foreign keys.
8.	It has high data redundancy.	While it has low data redundancy.

Conclusion:
Studied and understood Star and SnowFlake Schema and understood the limitations and advantages of both, using an example of Star and SnowFlake Schema on conceptual schema model.