**Experiment 3:**

a) Execute query selectors (comparison selectors, logical selectors ) and list out the results on any collection

**Comparison Selectors:**

$gt (Greater Than)

Find students older than 22.

db.students.find({ age: { $gt: 22 } })

$lt (Less Than)

Find students younger than 23.

db.students.find({ age: { $lt: 23 } })

$gte (Greater Than or Equal To)

Find students aged 22 or older.

db.students.find({ age: { $gte: 22 } })

$lte (Less Than or Equal To)

Find students aged 23 or younger.

db.students.find({ age: { $lte: 23 } })

$eq (Equal To)

Find students aged 22.

db.students.find({ age: { $eq: 22 } })

$ne (Not Equal To)

Find students not from the "AIML" department.

db.students.find({ department: { $ne: "AIML" } })

**Logical Selectors:**

$and (Both Conditions Must Be True)

Find students from CSE and older than 22.

db.students.find({

$and: [

{ department: "CSE" },

{ age: { $gt: 22 } }

]

})

$or (At Least One Condition Must Be True)

Find students who are either from AIML or IT.

db.students.find({

$or: [

{ department: "AIML" },

{ department: "IT" }

]

})

$not (Negates a Condition)

Find students who are not from the IT department.

db.students.find({

department: { $not: { $eq: "IT" } }

})

$nor (Neither Condition is True)

Find students who are neither from IT nor from CSE.

db.students.find({

$nor: [

{ department: "IT" },

{ department: "CSE" }

]

})

b) Execute query selectors (Geospatial selectors, Bitwise selectors ) and list out the results on anycollection.

**Geospatial Selectors**

Geospatial query selectors ($near, $geoWithin, $geoIntersects) to work with location-based data stored in GeoJSON format.

Modifying students Collection to Include Location Data

Students have a location field representing their latitude and longitude.

| **GeoJSON Type** | **Usage** | **Example** |
| --- | --- | --- |

|  |  |  |
| --- | --- | --- |
| **Point** | A single location | "coordinates": [77.5946, 12.9716] |

|  |  |  |
| --- | --- | --- |
| **LineString** | A **path** or **route** | "coordinates": [[Bangalore], [Hyderabad], [Delhi]] |

|  |  |  |
| --- | --- | --- |
| **Polygon** | A **region** or **boundary** | "coordinates": [[City1, City2, City3, City4, City1]] |

**Point:**

db.students.insertMany([

{ \_id: 30, name: "Esha", age: 22, department: "AIML", location: { type: "Point", coordinates: [77.5946, 12.9716] } }, // Bangalore

{ \_id: 31, name: "Farhan", age: 23, department: "CSE", location: { type: "Point", coordinates: [78.4867, 17.3850] } }, // Hyderabad

{ \_id: 32, name: "Gaurav", age: 24, department: "ECE", location: { type: "Point", coordinates: [72.8777, 19.0760] } }, // Mumbai

{ \_id: 33, name: "Himani", age: 21, department: "IT", location: { type: "Point", coordinates: [77.2090, 28.6139] } } // Delhi

])

Creating a 2dsphere Index

To perform geospatial queries, we need to create an index on the location field.

db.students.createIndex({ location: "2dsphere" })

$near (Find Students Near a Location)

Find students within a 50 km radius of Bangalore (77.5946, 12.9716).

db.students.find({

location: {

$near: {

$geometry: { type: "Point", coordinates: [77.5946, 12.9716] },

$maxDistance: 50000 // 50 km in meters

}

}

})

$geoWithin (Find Students Inside a Specific Area)

Find students within a defined polygon (e.g., Delhi, Mumbai, and Hyderabad).

db.students.find({

location: {

$geoWithin: {

$geometry: {

type: "Polygon",

coordinates: [[

[77.2090, 28.6139], // Delhi

[72.8777, 19.0760], // Mumbai

[78.4867, 17.3850], // Hyderabad

[77.2090, 28.6139] // Closing loop (Delhi)

]]

}

}

}

})

$geoIntersects (Find Students Who Fall on a Specific Geospatial Path)

Find students who fall exactly on a given line (example: a route from Delhi to Mumbai).

db.students.find({

location: {

$geoIntersects: {

$geometry: {

type: "LineString",

coordinates: [

[77.2090, 28.6139], // Delhi

[72.8777, 19.0760] // Mumbai

]

}

}

}

})

**LineString:**

**Inserting Students with Travel Routes (LineString)**

db.students.insertMany([

{

\_id: 50,

name: "Aarav",

age: 22,

department: "AIML",

travel\_route: {

type: "LineString",

coordinates: [

[77.5946, 12.9716], // Home (Bangalore)

[78.4867, 17.3850], // Transit (Hyderabad)

[77.2090, 28.6139] // University (Delhi)

]

}

},

{

\_id: 51,

name: "Sanya",

age: 23,

department: "CSE",

travel\_route: {

type: "LineString",

coordinates: [

[72.8777, 19.0760], // Home (Mumbai)

[77.2090, 28.6139], // Transit (Delhi)

[78.4867, 17.3850] // University (Hyderabad)

]

}

}

])

Find students whose **travel route intersects with Hyderabad (78.4867, 17.3850).**

db.students.find({

travel\_route: {

$geoIntersects: {

$geometry: { type: "Point", coordinates: [78.4867, 17.3850] }

}

}

})

**Polygon:**

**Inserting Students with Home Areas (Polygon)**

db.students.insertMany([

{

\_id: 52,

name: "Rohan",

age: 24,

department: "IT",

home\_area: {

type: "Polygon",

coordinates: [[

[77.5946, 12.9716], // Point 1 (Bangalore)

[78.4867, 17.3850], // Point 2 (Hyderabad)

[77.2090, 28.6139], // Point 3 (Delhi)

[72.8777, 19.0760], // Point 4 (Mumbai)

[77.5946, 12.9716] // Closing loop (Bangalore)

]]

}

},

{

\_id: 53,

name: "Kavya",

age: 21,

department: "ECE",

home\_area: {

type: "Polygon",

coordinates: [[

[80.2785, 13.0827], // Chennai

[81.8463, 16.5062], // Rajahmundry

[83.2185, 17.6868], // Visakhapatnam

[80.2785, 13.0827] // Closing loop (Chennai)

]]

}

}

])

Find students **who live inside the Bangalore-Hyderabad-Delhi-Mumbai zone**.

db.students.find({

location: {

$geoWithin: {

$geometry: {

type: "Polygon",

coordinates: [[

[77.5946, 12.9716], // Bangalore

[78.4867, 17.3850], // Hyderabad

[77.2090, 28.6139], // Delhi

[72.8777, 19.0760], // Mumbai

[77.5946, 12.9716] // Closing loop

]]

}

}

}

})

**Bitwise Selectors**

Add a permissions field where each bit represents access rights (e.g., 1 = Read, 2 = Write, 4 = Execute).

db.students.insertMany([

{ \_id: 20, name: "Amit", age: 22, department: "AIML", permissions: 5 }, // Binary: 101 (Read & Execute)

{ \_id: 21, name: "Bhavya", age: 23, department: "CSE", permissions: 3 }, // Binary: 011 (Read & Write)

{ \_id: 22, name: "Chirag", age: 24, department: "ECE", permissions: 6 }, // Binary: 110 (Write & Execute)

{ \_id: 23, name: "Diya", age: 21, department: "IT", permissions: 7 } // Binary: 111 (Read, Write, Execute)

])

$bitsAllSet (Match Documents Where All Specified Bits are Set)

Find students who have both Read (001) and Execute (100) permissions.

db.students.find({ permissions: { $bitsAllSet: 5 } }) // Binary 101

$bitsAnySet (Match If At Least One Specified Bit is Set)

Find students who have either Write (010) or Execute (100) permissions.

db.students.find({ permissions: { $bitsAnySet: 6 } }) // Binary 110

$bitsAllClear (Match If None of the Specified Bits Are Set)

Find students who do NOT have Execute (100) permissions.

db.students.find({ permissions: { $bitsAllClear: 4 } }) // Binary 100

$bitsAnyClear (Match If At Least One of the Specified Bits is Not Set)

Find students who are missing either Read (001) or Write (010) permissions.

db.students.find({ permissions: { $bitsAnyClear: 3 } }) // Binary 011