Experiment – 6: MongoDB

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1. Aim: To study CRUD operations in MongoDB

2. Problem Statement:

A. Create a database, create a collection, insert data, query and manipulate data using various MongoDB operations.

1. Create a database named "inventory".
2. Create a collection named "products" with the fields: (ProductID, ProductName, Category, Price, Stock).
3. Insert 10 documents into the "products" collection.
4. Display all the documents in the "products" collection.
5. Display all the products in the "Electronics" category.
6. Display all the products in ascending order of their names.
7. Display the details of the first 5 products.
8. Display the categories of products with a specific name.
9. Display the number of products in the "Electronics" category.
10. Display all the products without showing the "_id" field.
11. Display all the distinct categories of products.
12. Display products in the "Electronics" category with prices greater than 50 but less than 100.
13. Change the price of a product.
14. Delete a particular product entry.

3. Theory:

a. Describe some of the features of MongoDB?
MongoDB is a NoSQL database that offers several features:

Document-Oriented Storage – Stores data in flexible, JSON-like BSON documents.
Schema Flexibility – No fixed schema, allowing dynamic and hierarchical data structures.
Scalability – Supports horizontal scaling using Sharding.
Indexing – Uses indexes to improve query performance.
Replication – Ensures high availability using Replica Sets.
High Performance – Fast read and write operations, making it efficient for big data applications.

b. What are Documents and Collections in MongoDB?

Document: A JSON-like data structure containing key-value pairs. Example:

```
{
  "name": "John",
  "age": 25,
  "skills": ["MongoDB", "Node.js"]
}
```

Collection: A group of related documents, similar to a table in relational databases.

c. When to use MongoDB?

MongoDB is useful when:

1. Handling large-scale unstructured data (e.g., IoT, logs, user-generated content).
2. Applications require high-speed read/write operations (e.g., real-time analytics).
3. Scaling horizontally is necessary due to growing data.
4. Flexible schema is required, such as for social media platforms or content management systems.

d. What is Sharding in MongoDB?

Sharding is **MongoDB's method of horizontal scaling**, where data is distributed across multiple servers (shards). It helps:

1. Improve performance by distributing queries.
2. Handle large datasets beyond a single machine's capacity.
3. Ensure high availability and fault tolerance.
4. Sharding is implemented using a shard key, which decides how data is distributed across servers.

Implementation:

1.Use inventory;

2.db.createCollection("products");

3. db.products.insertMany([

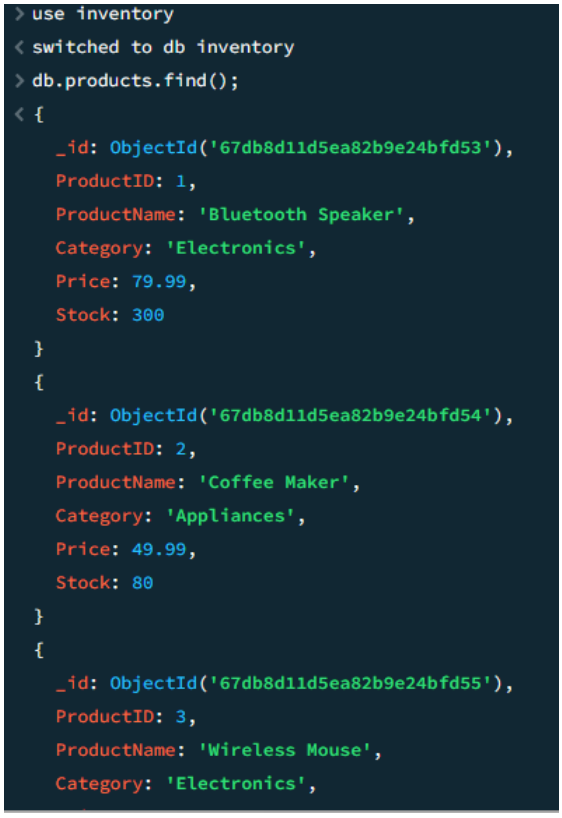
```
  {
    ProductID: 1,
    ProductName: "Laptop",
    Category: "Electronics",
    Price: 999.99,
    Stock: 50
  },
  {
    ProductID: 2,
```

```
  ProductName: "Smartphone",
  Category: "Electronics",
  Price: 699.99,
  Stock: 150
 },
 {
  ProductID: 3,
  ProductName: "Desk Chair",
  Category: "Furniture",
  Price: 149.99,
  Stock: 200
 },
 {
  ProductID: 4,
  ProductName: "Bluetooth Speaker",
  Category: "Electronics",
  Price: 79.99,
  Stock: 300
 },
 {
  ProductID: 5,
  ProductName: "Coffee Maker",
  Category: "Appliances",
  Price: 49.99,
  Stock: 80
 },
 {
  ProductID: 6,
  ProductName: "Wireless Mouse",
  Category: "Electronics",
  Price: 19.99,
  Stock: 250
 },
 {
  ProductID: 7,
  ProductName: "Refrigerator",
  Category: "Appliances",
  Price: 499.99,
  Stock: 40
 },
 {
  ProductID: 8,
  ProductName: "Smartwatch",
  Category: "Electronics",
  Price: 129.99,
  Stock: 180
 },
```

```
  {
    ProductID: 9,
    ProductName: "Office Desk",
    Category: "Furniture",
    Price: 199.99,
    Stock: 75
  },
  {
    ProductID: 10,
    ProductName: "Headphones",
    Category: "Electronics",
    Price: 89.99,
    Stock: 120
  }
  {
    ProductID: 11,
    ProductName: " Madhura-20 Laptop",
    Category: "Electronics",
    Price: 999.99,
    Stock: 50
  },
  {
    ProductID: 12,
    ProductName: "Madhura-20 Smartphone",
    Category: "Electronics",
    Price: 699.99,
    Stock: 150
  },
]);
```

```
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId('67db8d4dd5ea82b9e24bfd5a'),
    '1': ObjectId('67db8d4dd5ea82b9e24bfd5b'),
    '2': ObjectId('67db8d4dd5ea82b9e24bfd5c'),
    '3': ObjectId('67db8d4dd5ea82b9e24bfd5d'),
    '4': ObjectId('67db8d4dd5ea82b9e24bfd5e'),
    '5': ObjectId('67db8d4dd5ea82b9e24bfd5f'),
    '6': ObjectId('67db8d4dd5ea82b9e24bfd60'),
    '7': ObjectId('67db8d4dd5ea82b9e24bfd61'),
    '8': ObjectId('67db8d4dd5ea82b9e24bfd62'),
    '9': ObjectId('67db8d4dd5ea82b9e24bfd63')
  }
}
```

4. db.products.find();



```
> use inventory
< switched to db inventory
> db.products.find();
< {
    _id: ObjectId('67db8d11d5ea82b9e24bfd53'),
    ProductID: 1,
    ProductName: 'Bluetooth Speaker',
    Category: 'Electronics',
    Price: 79.99,
    Stock: 300
  }
  {
    _id: ObjectId('67db8d11d5ea82b9e24bfd54'),
    ProductID: 2,
    ProductName: 'Coffee Maker',
    Category: 'Appliances',
    Price: 49.99,
    Stock: 80
  }
  {
    _id: ObjectId('67db8d11d5ea82b9e24bfd55'),
    ProductID: 3,
    ProductName: 'Wireless Mouse',
    Category: 'Electronics',
```

5.db.products.find({ Category: "Electronics" });

```
db.products.find({ Category: "Electronics" });
{
  _id: ObjectId('67db8d11d5ea82b9e24bfd53'),
  ProductID: 1,
  ProductName: 'Bluetooth Speaker',
  Category: 'Electronics',
  Price: 79.99,
  Stock: 300
}
{
  _id: ObjectId('67db8d11d5ea82b9e24bfd55'),
  ProductID: 3,
  ProductName: 'Wireless Mouse',
  Category: 'Electronics',
  Price: 19.99,
  Stock: 250
}
{
  _id: ObjectId('67db8d11d5ea82b9e24bfd57'),
  ProductID: 5,
  ProductName: 'Smartwatch',
  Category: 'Electronics',
  Price: 129.99,
  Stock: 180
```

6. db.products.find().sort({ ProductName: 1 });

```
> db.products.find().sort({ ProductName: 1 });
< {
    _id: ObjectId('67db8d11d5ea82b9e24bfd53'),
    ProductID: 1,
    ProductName: 'Bluetooth Speaker',
    Category: 'Electronics',
    Price: 79.99,
    Stock: 300
  }
  {
    _id: ObjectId('67db8d11d5ea82b9e24bfd54'),
    ProductID: 2,
    ProductName: 'Coffee Maker',
    Category: 'Appliances',
    Price: 49.99,
    Stock: 80
  }
  {
    _id: ObjectId('67db8d4dd5ea82b9e24bfd5c'),
    ProductID: 10,
    ProductName: 'Desk Chair',
    Category: 'Furniture',
    Price: 149.99,
    Stock: 200
```

7. Display the details of the first 5 products.
db.products.find().limit(5);

```
> db.products.find().limit(5);
< {
    _id: ObjectId('67db8d11d5ea82b9e24bfd53'),
    ProductID: 1,
    ProductName: 'Bluetooth Speaker',
    Category: 'Electronics',
    Price: 79.99,
    Stock: 300
  }
  {
    _id: ObjectId('67db8d11d5ea82b9e24bfd54'),
    ProductID: 2,
    ProductName: 'Coffee Maker',
    Category: 'Appliances',
    Price: 49.99,
    Stock: 80
  }
  {
    _id: ObjectId('67db8d11d5ea82b9e24bfd55'),
    ProductID: 3,
    ProductName: 'Wireless Mouse',
```

8. db.products.find({ ProductName: "Laptop" }, { Category: 1, _id: 0 });

```
> db.products.find({ ProductName: "Laptop" }, { Category: 1, _id: 0 });
< {
    Category: 'Electronics'
  }
```

9. db.products.countDocuments({ Category: "Electronics" });

```
> db.products.countDocuments({ Category: "Electronics" });
< 6
```

10.db.products.find({}, { _id: 0 });

```
> db.products.find({}, { _id: 0 });
< {
    ProductID: 1,
    ProductName: 'Bluetooth Speaker',
    Category: 'Electronics',
    Price: 79.99,
    Stock: 300
  }
  {
    ProductID: 2,
    ProductName: 'Coffee Maker',
    Category: 'Appliances',
    Price: 49.99,
    Stock: 80
  }
  {
    ProductID: 3,
    ProductName: 'Wireless Mouse',
    Category: 'Electronics',
    Price: 19.99,
    Stock: 250
  }
```

11.db.products.distinct("Category");

```
> db.products.distinct("Category");
< [ 'Appliances', 'Electronics', 'Furniture' ]
inventory>
```

12. db.products.find({
Category: "Electronics",
Price: { $gt: 50, $lt: 100 }
});

```
> db.products.distinct("Category");
< [ 'Appliances', 'Electronics', 'Furniture' ]
> db.products.find({
    Category: "Electronics",
    Price: { $gt: 50, $lt: 100 }
  });
< {
    _id: ObjectId('67db8d11d5ea82b9e24bfd53'),
    ProductID: 1,
    ProductName: 'Bluetooth Speaker',
    Category: 'Electronics',
    Price: 79.99,
    Stock: 300
  }
  {
    _id: ObjectId('67db8d11d5ea82b9e24bfd59'),
    ProductID: 7,
    ProductName: 'Headphones',
    Category: 'Electronics',
    Price: 89.99,
    Stock: 120
  }
inventory>
```

13. db.products.updateOne(
{ ProductName: "Laptop" },
{ $set: { Price: 950.00 } }
);

14.db.products.deleteOne({ ProductName: "Smartphone" });

db.products.deleteOne({ ProductName: " Madhura-20 Laptop" });
{
acknowledged: true,
deletedCount: 1
}