WEEK 3 – ASSIGNMENT

Superset ID: 6390124

Spring Data JPA with Spring Boot, Hibernate Exercises:-

Exercise 1: Spring Data JPA - Quick Example

MySQL Workbench:

```
-- Create schema (database)
CREATE SCHEMA ormlearn;

-- Use the schema
USE ormlearn;

-- Create table
CREATE TABLE country (
    co_code VARCHAR(2) PRIMARY KEY,
    co_name VARCHAR(50)
);

-- Insert sample data
INSERT INTO country VALUES ('IN', 'India');
INSERT INTO country VALUES ('US', 'United States of America');
```

pom.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
                             https://maven.apache.org/xsd/maven-4.0.0.xsd">

    <modelVersion>4.0.0</modelVersion>

    <parent>
        <groupId>org.springframework.boot</groupId>
        <artifactId>spring-boot-starter-parent</artifactId>
        <version>3.1.5</version> <!-- safer version than 3.5.3 (not yet
released officially) -->
        <relativePath/> <!-- lookup parent from repository -->
    </parent>

    <groupId>com.cognizant</groupId>
    <artifactId>orm-learn</artifactId>
    <version>0.0.1-SNAPSHOT</version>
    <name>orm-learn</name>
    <description>Demo project for Spring Data JPA and Hibernate</description>

    <properties>
        <java.version>17</java.version>
    </properties>

    <dependencies>
        <!-- Spring Boot Data JPA -->
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-data-jpa</artifactId>
```

```
        </dependency>

        <!-- MySQL JDBC Driver -->
        <dependency>
            <groupId>com.mysql</groupId>
            <artifactId>mysql-connector-j</artifactId>
            <scope>runtime</scope>
        </dependency>

        <!-- DevTools (for hot reloads in development) -->
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-devtools</artifactId>
            <scope>runtime</scope>
            <optional>true</optional>
        </dependency>

        <!-- Testing -->
        <dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-test</artifactId>
            <scope>test</scope>
        </dependency>
    </dependencies>

    <build>
        <plugins>
            <!-- Spring Boot Maven Plugin -->
            <plugin>
                <groupId>org.springframework.boot</groupId>
                <artifactId>spring-boot-maven-plugin</artifactId>
            </plugin>
        </plugins>
    </build>

</project>
```

src/main/resources/application.properties

```
# ===== Logging Configuration =====
logging.level.org.springframework=INFO
logging.level.com.cognizant=DEBUG
logging.level.org.hibernate.SQL=DEBUG
logging.level.org.hibernate.type.descriptor.sql=TRACE

# Optional: Customize console log pattern (for better readability)
logging.pattern.console=%d{dd-MM-yy} %d{HH:mm:ss.SSS} %-20.20thread %5p %-
25.25logger{25} %25M %4L %m%n

# ===== Database Configuration =====
spring.datasource.driver-class-name=com.mysql.cj.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/ormlearn
spring.datasource.username=root
spring.datasource.password=Sharanbabu@545

# ===== Hibernate Configuration =====
```

```
# For Spring Boot 3.x and Hibernate 6.x, use MySQLDialect instead of
MySQL5Dialect
spring.jpa.hibernate.ddl-auto=validate
spring.jpa.properties.hibernate.dialect=org.hibernate.dialect.MySQLDialect
```

src/main/java/com/cognizant/orm_learn/model/Country.java

```
package com.cognizant.orm_learn.model;

import jakarta.persistence.Column;
import jakarta.persistence.Entity;
import jakarta.persistence.Id;
import jakarta.persistence.Table;

@Entity
@Table(name = "country")
public class Country {

    @Id
    @Column(name = "co_code")
    private String code;

    @Column(name = "co_name")
    private String name;

    // Getters and setters
    public String getCode() {
        return code;
    }

    public void setCode(String code) {
        this.code = code;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    @Override
    public String toString() {
        return "Country [code=" + code + ", name=" + name + "]";
    }
}
```

src/main/java/com/cognizant/orm_learn/service/CountryService.java

```
package com.cognizant.orm_learn.service;

import java.util.List;
import java.util.Optional;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
```

```
import com.cognizant.orm_learn.model.Country;
import com.cognizant.orm_learn.repository.CountryRepository;

import jakarta.transaction.Transactional;

@Service
public class CountryService {

    @Autowired
    private CountryRepository countryRepository;

    @Transactional
    public List<Country> getAllCountries() {
        return countryRepository.findAll();
    }

    @Transactional
    public Country getCountryByCode(String code) {
        Optional<Country> result = countryRepository.findById(code);
        return result.orElse(null);
    }
}
```

src/main/java/com/cognizant/orm_learn/repository/CountryRepository.java

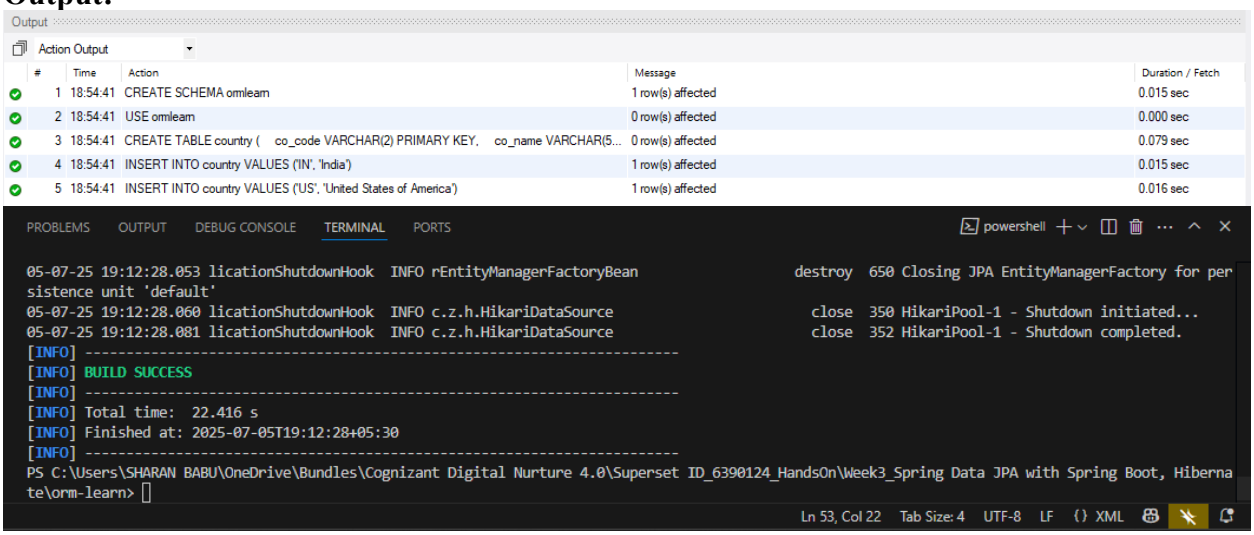
```
package com.cognizant.orm_learn.repository;

import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;
import com.cognizant.orm_learn.model.Country;

@Repository
public interface CountryRepository extends JpaRepository<Country, String> {
}
```

src/main/java/com/cognizant/orm_learn/OrmLearnApplication.java

```
package com.cognizant.orm_learn;

import java.util.List;

import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;

import com.cognizant.orm_learn.model.Country;
import com.cognizant.orm_learn.service.CountryService;

@SpringBootApplication
public class OrmLearnApplication {

    private static CountryService countryService;

    private static final Logger LOGGER =
LoggerFactory.getLogger(OrmLearnApplication.class);
```

```
    public static void main(String[] args) {
        ApplicationContext context =
SpringApplication.run(OrmLearnApplication.class, args);
        countryService = context.getBean(CountryService.class);

        testGetAllCountries();
    }

    private static void testGetAllCountries() {
        LOGGER.info("Start");
        List<Country> countries = countryService.getAllCountries();
        for (Country country : countries) {
            LOGGER.debug("Country: {}", country);
        }
        LOGGER.info("End");
    }
}
```

Output:



Exercise 2: Difference between JPA, Hibernate and Spring Data JPA

Feature / Aspect	JPA (Java Persistence API)	Hibernate	Spring Data JPA
Type	Specification	Implementation of JPA	Abstraction over JPA and Hibernate
Developed By	Oracle (as part of Java EE specification)	Red Hat	Spring Team
Purpose	Provides a set of interfaces and annotations for object-relational mapping (ORM)	Implements JPA specification and adds advanced ORM features	Simplifies data access layer by removing boilerplate JPA code
Requires Implementation	Yes	No (it is an implementation)	Yes (uses JPA provider like Hibernate underneath)
Can Be Used Alone	No	Yes	No (must be used with Spring Framework)
Boilerplate Code	Requires writing boilerplate code like EntityManager handling	Requires session and transaction handling	Reduces boilerplate with auto-implemented repository methods
Ease of Use	Complex	Moderate	Very simple and developer-friendly

Entity Management	Done via EntityManager	Done via Session	Done via JpaRepository and interface-based programming
Configuration Style	Annotations and XML	Annotations and XML	Annotation-based, auto-configured via Spring Boot
Query Language Support	JPQL (Java Persistence Query Language)	HQL (Hibernate Query Language), JPQL	JPQL, Derived Queries, Custom Queries with @Query
Caching Support	Basic caching (via provider)	Advanced caching (first-level, second-level caching)	Inherited from JPA provider like Hibernate
Vendor Dependency	Vendor-neutral	Hibernate-specific	Vendor-neutral (works with any JPA provider like Hibernate, EclipseLink, etc.)
Spring Integration	Manual integration needed	Manual or partial integration	Fully integrated with Spring and Spring Boot
Common Use Case	When developing low-level JPA applications	When needing fine-grained control over ORM functionality	When building enterprise apps with minimal effort in data access
Code Example Required	Yes, you must write code for EntityManager, transactions, etc.	Yes, you must manage Session, Transaction, etc.	No, only interface definitions are needed for standard CRUD operations
Support for Derived Query Methods	Not available	Not available	Available through method name conventions (e.g., findByName(), findByCode())
Spring Boot Compatibility	Requires manual configuration	Requires manual configuration	Auto-configured in Spring Boot with minimal setup

Exercise 3: Implement services for managing Country

src/main/java/com/cognizant/orm_learn/model/Country1.java

```
package com.cognizant.orm_learn.model;

import jakarta.persistence.*;

@Entity
@Table(name = "country")
public class Country1 {

    @Id
    @Column(name = "co_code")
    private String code;

    @Column(name = "co_name")
    private String name;

    public String getCode() {
        return code;
    }

    public void setCode(String code) {
        this.code = code;
    }

    public String getName() {
```

```
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    @Override
    public String toString() {
        return "Country1 [code=" + code + ", name=" + name + "]";
    }
}
```

src/main/java/com/cognizant/orm_learn/repository/CountryRepository1.java

```
package com.cognizant.orm_learn.repository;

import org.springframework.data.jpa.repository.JpaRepository;
import com.cognizant.orm_learn.model.Country1;
import org.springframework.stereotype.Repository;

@Repository
public interface CountryRepository1 extends JpaRepository<Country1, String> {
}
```

src/main/java/com/cognizant/orm_learn/service/CountryService1.java

```
package com.cognizant.orm_learn.service;

import java.util.List;
import java.util.Optional;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import jakarta.transaction.Transactional;

import com.cognizant.orm_learn.model.Country1;
import com.cognizant.orm_learn.repository.CountryRepository1;

@Service
public class CountryService1 {

    @Autowired
    private CountryRepository1 countryRepository1;

    @Transactional
    public List<Country1> getAllCountries() {
        return countryRepository1.findAll();
    }

    @Transactional
    public Country1 findCountryByCode(String code) throws Exception {
        Optional<Country1> result = countryRepository1.findById(code);
        if (result.isPresent()) {
            return result.get();
        } else {
            throw new Exception("Country not found");
        }
```

```
    }

    @Transactional
    public void addCountry(Country1 country) {
        countryRepository1.save(country);
    }

    @Transactional
    public void updateCountry(Country1 country) throws Exception {
        if (countryRepository1.existsById(country.getCode())) {
            countryRepository1.save(country);
        } else {
            throw new Exception("Country not found for update");
        }
    }

    @Transactional
    public void deleteCountry(String code) throws Exception {
        if (countryRepository1.existsById(code)) {
            countryRepository1.deleteById(code);
        } else {
            throw new Exception("Country not found for delete");
        }
    }
}
```

src/main/java/com/cognizant/orm_learn/OrmLearnApplication1.java

```
package com.cognizant.orm_learn;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;

import com.cognizant.orm_learn.model.Country1;
import com.cognizant.orm_learn.service.CountryService1;

import java.util.List;

@SpringBootApplication
public class OrmLearnApplication1 {

    private static CountryService1 countryService1;

    public static void main(String[] args) throws Exception {
        ApplicationContext context =
SpringApplication.run(OrmLearnApplication1.class, args);
        countryService1 = context.getBean(CountryService1.class);

        testGetAllCountries();
        testFindCountryByCode();
        testAddCountry();
        testUpdateCountry();
        testDeleteCountry();
    }

    private static void testGetAllCountries() {
```

```
        System.out.println("All countries:");
        List<Country1> countries = countryService1.getAllCountries();
        countries.forEach(System.out::println);
    }

    private static void testFindCountryByCode() throws Exception {
        System.out.println("Find country with code IN:");
        System.out.println(countryService1.findCountryByCode("IN"));
    }

    private static void testAddCountry() {
        Country1 newCountry = new Country1();
        newCountry.setCode("JP");
        newCountry.setName("Japan");
        countryService1.addCountry(newCountry);
        System.out.println("Added country: " + newCountry);
    }

    private static void testUpdateCountry() throws Exception {
        Country1 update = new Country1();
        update.setCode("JP");
        update.setName("Japan Updated");
        countryService1.updateCountry(update);
        System.out.println("Updated country: " + update);
    }

    private static void testDeleteCountry() throws Exception {
        countryService1.deleteCountry("JP");
        System.out.println("Deleted country with code JP");
    }
}
```

Output:

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS

ame from country c1_0 where c1_0.co_code=?
05-07-25 19:37:43.267 restartedMain        DEBUG org.hibernate.SQL                    logStatement  133 delete from country where co_
code=?
Deleted country with code JP
05-07-25 19:37:43.339 licationShutdownHook  INFO rEntityManagerFactoryBean                 destroy  650 Closing JPA EntityManagerFact
ory for persistence unit 'default'
05-07-25 19:37:43.353 licationShutdownHook  INFO c.z.h.HikariDataSource                      close  350 HikariPool-1 - Shutdown initi
ated...
05-07-25 19:37:43.426 licationShutdownHook  INFO c.z.h.HikariDataSource                      close  352 HikariPool-1 - Shutdown compl
eted.
PS C:\Users\SHARAN BABU\OneDrive\Bundles\Cognizant Digital Nurture 4.0\Superset ID_6390124_HandsOn\Week3_Spring Data JPA with Spring Bo
ot, Hibernate\orm-learn>
```

Exercise 4: Find a country based on country code

src/main/java/com/cognizant/orm_learn/model/Country2.java

```
package com.cognizant.orm_learn.model;

import jakarta.persistence.*;

@Entity
@Table(name = "country")
public class Country2 {

    @Id
```

```
    @Column(name = "co_code")
    private String code;

    @Column(name = "co_name")
    private String name;

    public String getCode() {
        return code;
    }

    public void setCode(String code) {
        this.code = code;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    @Override
    public String toString() {
        return "Country2 [code=" + code + ", name=" + name + "]";
    }
}
```

src/main/java/com/cognizant/orm_learn/repository/CountryRepository2.java

```
package com.cognizant.orm_learn.repository;

import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;
import com.cognizant.orm_learn.model.Country2;

@Repository
public interface CountryRepository2 extends JpaRepository<Country2, String> {
    // JpaRepository provides findById(String code) by default
}
```

src/main/java/com/cognizant/orm_learn/service/CountryService2.java

```
package com.cognizant.orm_learn.service;

import java.util.Optional;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import jakarta.transaction.Transactional;

import com.cognizant.orm_learn.model.Country2;
import com.cognizant.orm_learn.repository.CountryRepository2;

@Service
public class CountryService2 {

    @Autowired
```

```
    private CountryRepository2 countryRepository2;

    @Transactional
    public Country2 findCountryByCode(String code) throws Exception {
        Optional<Country2> result = countryRepository2.findById(code);
        if (result.isPresent()) {
            return result.get();
        } else {
            throw new Exception("Country with code " + code + " not found.");
        }
    }
}
```

src/main/java/com/cognizant/orm_learn/OrmLearnApplication2.java

```
package com.cognizant.orm_learn;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;
import com.cognizant.orm_learn.service.CountryService2;
import com.cognizant.orm_learn.model.Country2;

@SpringBootApplication
public class OrmLearnApplication2 {

    private static CountryService2 countryService2;

    public static void main(String[] args) throws Exception {
        ApplicationContext context =
SpringApplication.run(OrmLearnApplication2.class, args);
        countryService2 = context.getBean(CountryService2.class);

        testFindCountryByCode();
    }

    private static void testFindCountryByCode() throws Exception {
        System.out.println("Finding country with code IN...");
        Country2 country = countryService2.findCountryByCode("IN");
        System.out.println("Result: " + country);
    }
}
```

Output:

Exercise 5: Add a new country

src/main/java/com/cognizant/orm_learn/model/Country3.java

```
package com.cognizant.orm_learn.model;

import jakarta.persistence.*;

@Entity
@Table(name = "country")
public class Country3 {

    @Id
    @Column(name = "co_code")
    private String code;

    @Column(name = "co_name")
    private String name;

    public String getCode() {
        return code;
    }

    public void setCode(String code) {
        this.code = code;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    @Override
    public String toString() {
        return "Country3 [code=" + code + ", name=" + name + "]";
    }
}
```

src/main/java/com/cognizant/orm_learn/repository/CountryRepository3.java

```
package com.cognizant.orm_learn.repository;

import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;
import com.cognizant.orm_learn.model.Country3;

@Repository
public interface CountryRepository3 extends JpaRepository<Country3, String> {
}
```

src/main/java/com/cognizant/orm_learn/service/CountryService3.java

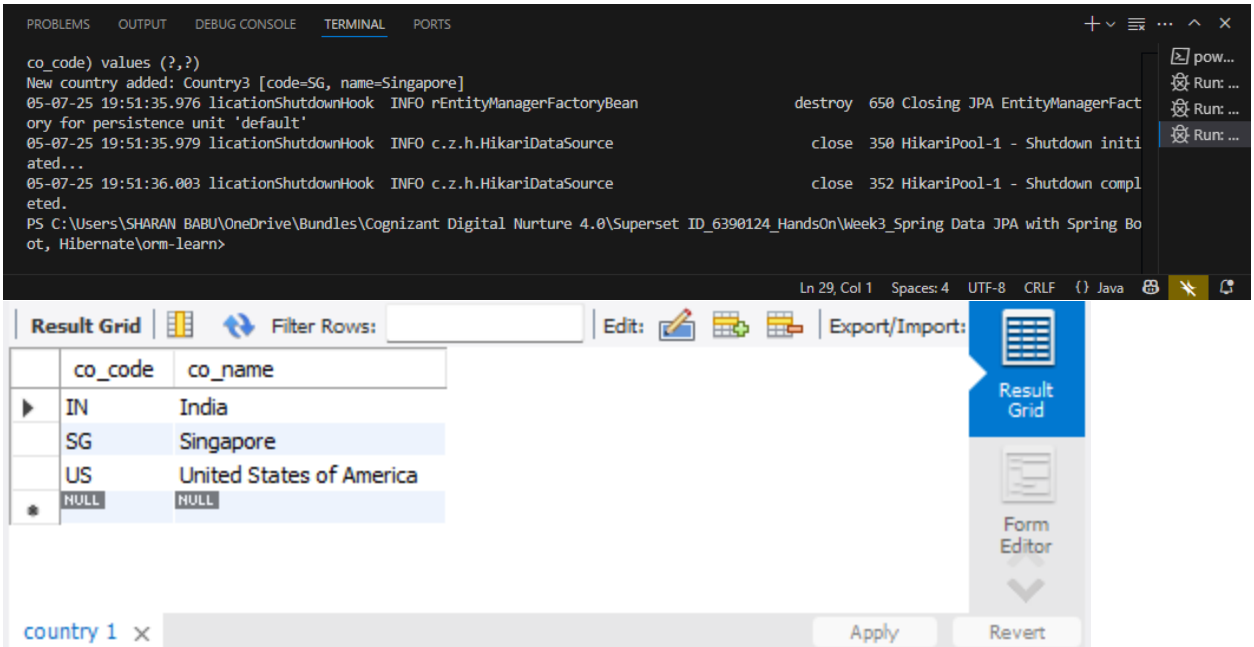
```
package com.cognizant.orm_learn.service;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import jakarta.transaction.Transactional;
```

```
import com.cognizant.orm_learn.model.Country3;
import com.cognizant.orm_learn.repository.CountryRepository3;

@Service
public class CountryService3 {

    @Autowired
    private CountryRepository3 countryRepository3;

    @Transactional
    public void addCountry(Country3 country) {
        countryRepository3.save(country);
    }
}
```

src/main/java/com/cognizant/orm_learn/OrmLearnApplication3.java

```
package com.cognizant.orm_learn;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;
import com.cognizant.orm_learn.model.Country3;
import com.cognizant.orm_learn.service.CountryService3;

@SpringBootApplication
public class OrmLearnApplication3 {

    private static CountryService3 countryService3;

    public static void main(String[] args) {
        ApplicationContext context =
SpringApplication.run(OrmLearnApplication3.class, args);
        countryService3 = context.getBean(CountryService3.class);

        testAddCountry();
    }

    private static void testAddCountry() {
        Country3 country = new Country3();
        country.setCode("SG");
        country.setName("Singapore");
        countryService3.addCountry(country);
        System.out.println("New country added: " + country);
    }
}
```

Output:



Exercise 6: Demonstrate implementation of Query Methods feature of Spring Data JPA

MySQL Workbench:

```
CREATE DATABASE ormlearn;
USE ormlearn;
CREATE TABLE country (
    co_code VARCHAR(10) PRIMARY KEY,
    co_name VARCHAR(100)
);
INSERT INTO country (co_code, co_name) VALUES
('ZA', 'South Africa'),
('SS', 'South Sudan'),
('DJ', 'Djibouti'),
('BV', 'Bouvet Island'),
('TF', 'French Southern Territories'),
('GP', 'Guadeloupe'),
('LU', 'Luxembourg'),
('UM', 'United States Minor Outlying Islands'),
('GS', 'South Georgia and the South Sandwich Islands'),
('ZM', 'Zambia'),
('ZW', 'Zimbabwe');
```

src/main/resources/application.properties

```
spring.datasource.url=jdbc:mysql://localhost:3306/ormlearn
spring.datasource.username=root
spring.datasource.password=Sharanbabu@545

spring.jpa.show-sql=true
spring.jpa.hibernate.ddl-auto=update
```

src/main/java/com/cognizant/orm_query_methods_demo/model/Country.java

```
package com.cognizant.orm_query_methods_demo.model;

import jakarta.persistence.*;

@Entity
@Table(name = "country")
public class Country {
    @Id
    @Column(name = "co_code")
    private String code;

    @Column(name = "co_name")
    private String name;

    // Getters and setters
    public String getCode() { return code; }
    public void setCode(String code) { this.code = code; }
    public String getName() { return name; }
    public void setName(String name) { this.name = name; }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/repository/CountryRepository.java

```
package com.cognizant.orm_query_methods_demo.repository;

import com.cognizant.orm_query_methods_demo.model.Country;
import org.springframework.data.jpa.repository.JpaRepository;
import java.util.List;

public interface CountryRepository extends JpaRepository<Country, String> {
    List<Country> findByNameContaining(String name);
    List<Country> findByNameContainingOrderByNameAsc(String name);
    List<Country> findByNameStartingWith(String prefix);
}
```

src/main/java/com/cognizant/orm_query_methods_demo/OrmQueryMethodsDemoApplication.java

```
package com.cognizant.orm_query_methods_demo;

import com.cognizant.orm_query_methods_demo.model.Country;
import com.cognizant.orm_query_methods_demo.repository.CountryRepository;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;

import java.util.List;

@SpringBootApplication
public class OrmQueryMethodsDemoApplication {

    private static CountryRepository countryRepository;

    public static void main(String[] args) {
```

```
        ApplicationContext context =
SpringApplication.run(OrmQueryMethodsDemoApplication.class, args);
        countryRepository = context.getBean(CountryRepository.class);

        testFindByNameContaining();
        testFindByNameContainingOrderByNameAsc();
        testFindByNameStartingWith();
    }

    static void testFindByNameContaining() {
        List<Country> list = countryRepository.findByNameContaining("ou");
        list.forEach(c -> System.out.println("Found (contains 'ou'): " +
c.getName()));
    }

    static void testFindByNameContainingOrderByNameAsc() {
        List<Country> list =
countryRepository.findByNameContainingOrderByNameAsc("ou");
        list.forEach(c -> System.out.println("Sorted Asc (contains 'ou'): " +
c.getName()));
    }

    static void testFindByNameStartingWith() {
        List<Country> list = countryRepository.findByNameStartingWith("Z");
        list.forEach(c -> System.out.println("Starts with Z: " +
c.getName()));
    }
}
```

Output:

Output

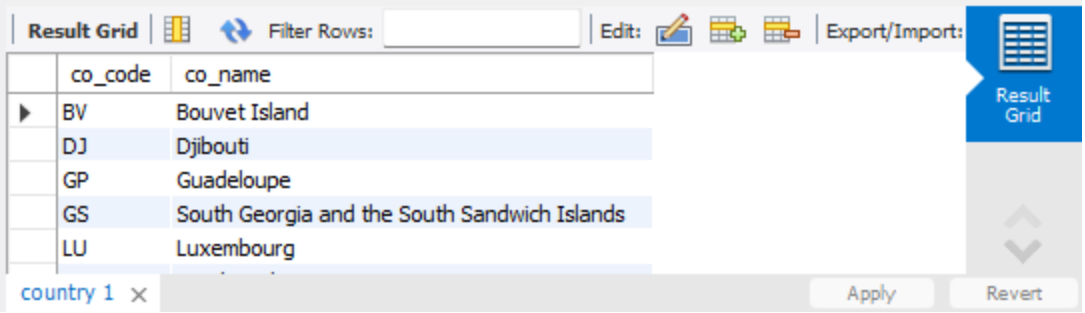
Action Output

#	Time	Action	Message	Duration / Fetch
1	20:38:54	USE omleam	0 row(s) affected	0.000 sec
2	20:38:54	DROP TABLE country	0 row(s) affected	0.032 sec
3	20:38:54	CREATE TABLE country (co_code VARCHAR(10) PRIMARY KEY, co_name VARCHA...	0 row(s) affected	0.047 sec
4	20:38:54	INSERT INTO country (co_code, co_name) VALUES ('ZA', 'South Africa'), ('SS', 'South Suda...	11 row(s) affected Records: 11 Duplicates: 0 Warnings: 0	0.016 sec
5	20:40:05	SELECT * FROM country LIMIT 0, 1000	11 row(s) returned	0.000 sec / 0.000 sec

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS Run: OrmQueryMethodsDemoApplication

```
Sorted Asc (contains 'ou'): French Southern Territories
Sorted Asc (contains 'ou'): Guadeloupe
Sorted Asc (contains 'ou'): Luxembourg
Sorted Asc (contains 'ou'): South Africa
Sorted Asc (contains 'ou'): South Georgia and the South Sandwich Islands
Sorted Asc (contains 'ou'): South Sudan
Sorted Asc (contains 'ou'): United States Minor Outlying Islands
Hibernate: select c1_0.co_code,c1_0.co_name from country c1_0 where c1_0.co_name like ? escape '\\'
Starts with Z: Zambia
Starts with Z: Zimbabwe
```

Ln 7, Col 1 (196 selected) Spaces: 4 UTF-8 LF {} Java Properties



co_code	co_name
BV	Bouvet Island
DJ	Djibouti
GP	Guadeloupe
GS	South Georgia and the South Sandwich Islands
LU	Luxembourg

Exercise 7: Demonstrate implementation of O/R Mapping

MySQL Workbench:

```
CREATE DATABASE ormlearn;
USE ormlearn;
CREATE TABLE department (
    dp_id INT PRIMARY KEY AUTO_INCREMENT,
    dp_name VARCHAR(100)
);

CREATE TABLE employee (
    em_id INT PRIMARY KEY AUTO_INCREMENT,
    em_name VARCHAR(100),
    em_salary DOUBLE,
    em_permanent BOOLEAN,
    em_date_of_birth DATE,
    em_dp_id INT,
    FOREIGN KEY (em_dp_id) REFERENCES department(dp_id)
);

CREATE TABLE skill (
    sk_id INT PRIMARY KEY AUTO_INCREMENT,
    sk_name VARCHAR(100)
);

CREATE TABLE employee_skill (
    es_em_id INT,
    es_sk_id INT,
    PRIMARY KEY (es_em_id, es_sk_id),
    FOREIGN KEY (es_em_id) REFERENCES employee(em_id),
    FOREIGN KEY (es_sk_id) REFERENCES skill(sk_id)
);
```

src/main/resources/application.properties

```
spring.datasource.url=jdbc:mysql://localhost:3306/ormlearn
spring.datasource.username=root
spring.datasource.password=Sharanbabu@545

spring.jpa.show-sql=true
spring.jpa.hibernate.ddl-auto=update
```

src/main/java/com/cognizant/orm_query_methods_demo/model/Employee.java

```
package com.cognizant.orm_query_methods_demo.model;

import jakarta.persistence.*;
```

```
import java.util.Date;
import java.util.Set;

@Entity
@Table(name = "employee")
public class Employee {

    @Id
    @Column(name = "em_id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    @Column(name = "em_name")
    private String name;

    @Column(name = "em_salary")
    private double salary;

    @Column(name = "em_permanent", nullable = false)
    private boolean permanent;

    @Column(name = "em_date_of_birth")
    @Temporal(TemporalType.DATE)
    private Date dateOfBirth;

    @ManyToOne
    @JoinColumn(name = "em_dp_id")
    private Department department;

    @ManyToMany(fetch = FetchType.EAGER)
    @JoinTable(name = "employee_skill", joinColumns = @JoinColumn(name =
"es_em_id"), inverseJoinColumns = @JoinColumn(name = "es_sk_id"))
    private Set<Skill> skillList;

    // Getters and setters
    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public double getSalary() {
        return salary;
    }

    public void setSalary(double salary) {
        this.salary = salary;
```

```
    }

    public boolean isPermanent() {
        return permanent;
    }

    public void setPermanent(boolean permanent) {
        this.permanent = permanent;
    }

    public Date getDateOfBirth() {
        return dateOfBirth;
    }

    public void setDateOfBirth(Date dateOfBirth) {
        this.dateOfBirth = dateOfBirth;
    }

    public Department getDepartment() {
        return department;
    }

    public void setDepartment(Department department) {
        this.department = department;
    }

    public Set<Skill> getSkillList() {
        return skillList;
    }

    public void setSkillList(Set<Skill> skillList) {
        this.skillList = skillList;
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/model/Skill.java

```
package com.cognizant.orm_query_methods_demo.model;

import jakarta.persistence.*;
import java.util.Set;

@Entity
@Table(name = "skill")
public class Skill {

    @Id
    @Column(name = "sk_id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    @Column(name = "sk_name")
    private String name;

    @ManyToMany(mappedBy = "skillList")
    private Set<Employee> employeeList;
```

```
    // Getters and setters
    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public Set<Employee> getEmployeeList() {
        return employeeList;
    }

    public void setEmployeeList(Set<Employee> employeeList) {
        this.employeeList = employeeList;
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/model/Department.java

```
package com.cognizant.orm_query_methods_demo.model;

import jakarta.persistence.*;
import java.util.Set;

@Entity
@Table(name = "department")
public class Department {

    @Id
    @Column(name = "dp_id")
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    @Column(name = "dp_name")
    private String name;

    @OneToMany(mappedBy = "department")
    private Set<Employee> employeeList;

    // Getters and setters
    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }
```

```
    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public Set<Employee> getEmployeeList() {
        return employeeList;
    }

    public void setEmployeeList(Set<Employee> employeeList) {
        this.employeeList = employeeList;
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/repository/ EmployeeRepository.java

```
package com.cognizant.orm_query_methods_demo.repository;

import com.cognizant.orm_query_methods_demo.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;

public interface EmployeeRepository extends JpaRepository<Employee, Integer>
{
}
```

src/main/java/com/cognizant/orm_query_methods_demo/repository/SkillRepository.java

```
package com.cognizant.orm_query_methods_demo.repository;

import com.cognizant.orm_query_methods_demo.model.Skill;
import org.springframework.data.jpa.repository.JpaRepository;

public interface SkillRepository extends JpaRepository<Skill, Integer> {
}
```

src/main/java/com/cognizant/orm_query_methods_demo/repository/ DepartmentRepository.java

```
package com.cognizant.orm_query_methods_demo.repository;

import com.cognizant.orm_query_methods_demo.model.Department;
import org.springframework.data.jpa.repository.JpaRepository;

public interface DepartmentRepository extends JpaRepository<Department,
Integer> {
}
```

src/main/java/com/cognizant/orm_query_methods_demo/service/EmployeeService.java

```
package com.cognizant.orm_query_methods_demo.service;

import com.cognizant.orm_query_methods_demo.model.Employee;
import com.cognizant.orm_query_methods_demo.repository.EmployeeRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
```

```
@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    public Employee get(int id) {
        return employeeRepository.findById(id).orElse(null);
    }

    public void save(Employee employee) {
        employeeRepository.save(employee);
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/service/DepartmentService.java

```
package com.cognizant.orm_query_methods_demo.service;

import com.cognizant.orm_query_methods_demo.model.Department;
import com.cognizant.orm_query_methods_demo.repository.DepartmentRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

@Service
public class DepartmentService {

    @Autowired
    private DepartmentRepository departmentRepository;

    public Department get(int id) {
        return departmentRepository.findById(id).orElse(null);
    }

    public void save(Department department) {
        departmentRepository.save(department);
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/service/SkillService.java

```
package com.cognizant.orm_query_methods_demo.service;

import com.cognizant.orm_query_methods_demo.model.Skill;
import com.cognizant.orm_query_methods_demo.repository.SkillRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

@Service
public class SkillService {

    @Autowired
    private SkillRepository skillRepository;

    public Skill get(int id) {
        return skillRepository.findById(id).orElse(null);
    }
```

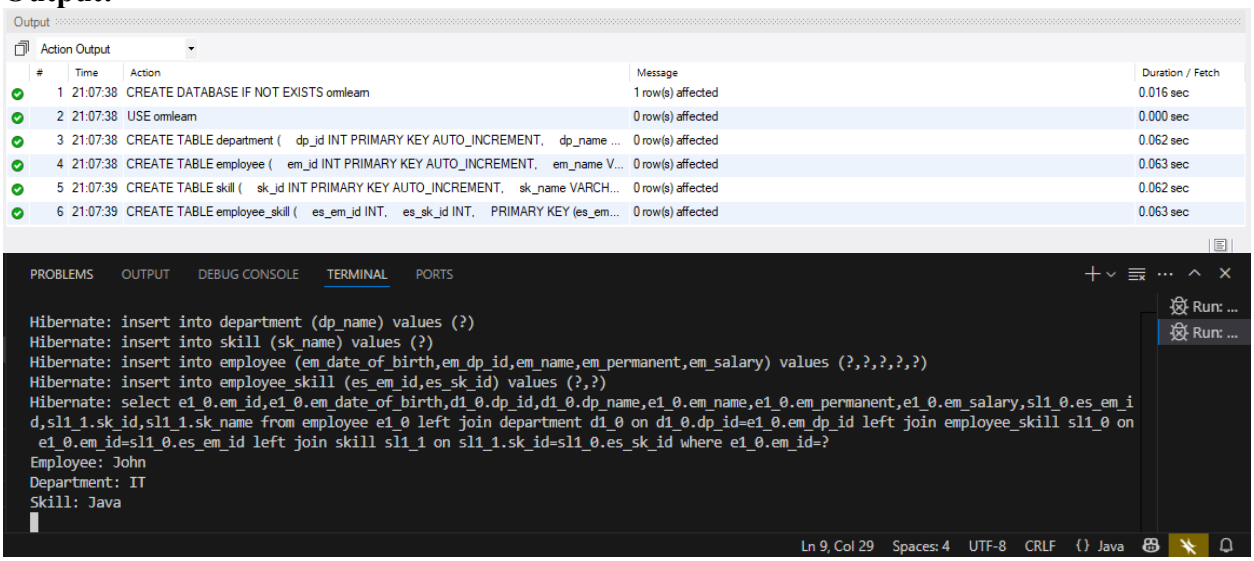
```
    public void save(Skill skill) {
        skillRepository.save(skill);
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/ OrmQueryMethodsDemoApplication1.java

```
// Main Application Class
package com.cognizant.orm_query_methods_demo;

import com.cognizant.orm_query_methods_demo.model.*;
import com.cognizant.orm_query_methods_demo.service.*;
import org.springframework.boot.CommandLineRunner;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.annotation.Bean;

import java.util.*;

@SpringBootApplication
public class OrmQueryMethodsDemoApplication1 {

    public static void main(String[] args) {
        SpringApplication.run(OrmQueryMethodsDemoApplication.class, args);
    }

    @Bean
    CommandLineRunner run(EmployeeService employeeService, DepartmentService
departmentService,
            SkillService skillService) {
        return args -> {
            // Add Department
            Department dept = new Department();
            dept.setName("IT");
            departmentService.save(dept);

            // Add Skill
            Skill skill = new Skill();
            skill.setName("Java");
            skillService.save(skill);

            // Add Employee
            Employee emp = new Employee();
            emp.setName("John");
            emp.setSalary(50000);
            emp.setPermanent(true);
            emp.setDateOfBirth(new Date());
            emp.setDepartment(dept);
            emp.setSkillList(new HashSet<>(Arrays.asList(skill)));
            employeeService.save(emp);

            // Fetch Employee
            Employee fetched = employeeService.get(emp.getId());
            System.out.println("Employee: " + fetched.getName());
```

```
            System.out.println("Department: " +
fetched.getDepartment().getName());
            fetched.getSkillList().forEach(s -> System.out.println("Skill: "
+ s.getName()));
        };
    }
}
```

Output:



Exercise 8: Demonstrate writing Hibernate Query Language and Native Query

MySQL Workbench:

```
CREATE DATABASE ormlearn;
USE ormlearn;
-- Create table for department2
CREATE TABLE department2 (
    id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(50) NOT NULL
);

-- Create table for skill2
CREATE TABLE skill2 (
    id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(50) NOT NULL
);

-- Create table for employee2
CREATE TABLE employee2 (
    id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(100) NOT NULL,
    date_of_birth DATE,
    salary DOUBLE,
    permanent BOOLEAN,
    dp_id INT,
    CONSTRAINT fk_department2 FOREIGN KEY (dp_id) REFERENCES department2(id)
);
```

```
-- Create join table for employee2 and skill2 (Many-to-Many)
CREATE TABLE employee_skill2 (
    es_em_id INT,
    es_sk_id INT,
    PRIMARY KEY (es_em_id, es_sk_id),
    CONSTRAINT fk_emp2 FOREIGN KEY (es_em_id) REFERENCES employee2(id),
    CONSTRAINT fk_skill2 FOREIGN KEY (es_sk_id) REFERENCES skill2(id)
);

-- Insert sample data into department2
INSERT INTO department2 (id, name) VALUES
(1, 'Engineering'),
(2, 'HR');

-- Insert sample data into skill2
INSERT INTO skill2 (id, name) VALUES
(1, 'Java'),
(2, 'Spring Boot'),
(3, 'SQL');

-- Insert sample data into employee2
INSERT INTO employee2 (id, name, date_of_birth, salary, permanent, dp_id)
VALUES
(1, 'John', '1990-01-01', 50000, true, 1),
(2, 'Alice', '1992-03-15', 45000, false, 2),
(3, 'Bob', '1988-07-20', 55000, true, 1);

-- Insert sample data into employee_skill2
INSERT INTO employee_skill2 (es_em_id, es_sk_id) VALUES
(1, 1),
(1, 2),
(3, 3);
```

src/main/resources/application.properties

```
spring.datasource.url=jdbc:mysql://localhost:3306/ormlearn
spring.datasource.username=root
spring.datasource.password=Sharanbabu@545

spring.jpa.show-sql=true
spring.jpa.hibernate.ddl-auto=update
```

src/main/java/com/cognizant/orm_query_methods_demo/entity/Department2.java

```
package com.cognizant.orm_query_methods_demo.entity;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Data
@NoArgsConstructor
@AllArgsConstructor
public class Department2 {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
```

```
    private int id;

    private String name;
}
```

src/main/java/com/cognizant/orm_query_methods_demo/entity/Employee2.java

```
package com.cognizant.orm_query_methods_demo.entity;

import jakarta.persistence.*;
import lombok.*;

import java.util.Date;
import java.util.List;

@Entity
@Data
@NoArgsConstructor
@AllArgsConstructor
public class Employee2 {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    private String name;

    @Temporal(TemporalType.DATE)
    private Date dateOfBirth;

    private double salary;

    private boolean permanent;

    @ManyToOne(fetch = FetchType.LAZY)
    @JoinColumn(name = "dp_id")
    private Department2 department;

    @ManyToMany(fetch = FetchType.LAZY)
    @JoinTable(name = "employee_skill2", joinColumns = @JoinColumn(name =
"es_em_id"), inverseJoinColumns = @JoinColumn(name = "es_sk_id"))
    private List<Skill2> skillList;
}
```

src/main/java/com/cognizant/orm_query_methods_demo/entity/Skill2.java

```
package com.cognizant.orm_query_methods_demo.entity;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Data
@NoArgsConstructor
@AllArgsConstructor
public class Skill2 {

    @Id
```

```
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    private String name;
}
```

src/main/java/com/cognizant/orm_query_methods_demo/repository/ EmployeeRepository2.java

```
package com.cognizant.orm_query_methods_demo.repository;

import com.cognizant.orm_query_methods_demo.entity.Employee2;
import org.springframework.data.jpa.repository.*;
import org.springframework.data.repository.query.Param;
import org.springframework.stereotype.Repository;

import java.util.List;

@Repository
public interface EmployeeRepository2 extends JpaRepository<Employee2,
Integer> {

    @Query("SELECT e FROM Employee2 e WHERE e.permanent = true")
    List<Employee2> getAllPermanentEmployees();

    @Query("SELECT e FROM Employee2 e LEFT JOIN FETCH e.department d LEFT
JOIN FETCH e.skillList WHERE e.permanent = true")
    List<Employee2> getAllPermanentEmployeesWithFetch();

    @Query("SELECT AVG(e.salary) FROM Employee2 e WHERE e.department.id =
:id")
    double getAverageSalary(@Param("id") int departmentId);

    @Query(value = "SELECT * FROM employee2", nativeQuery = true)
    List<Employee2> getAllEmployeesNative();
}
```

src/main/java/com/cognizant/orm_query_methods_demo/service/EmployeeService2.java

```
package com.cognizant.orm_query_methods_demo.service;

import com.cognizant.orm_query_methods_demo.entity.Employee2;
import com.cognizant.orm_query_methods_demo.repository.EmployeeRepository2;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;

@Service
public class EmployeeService2 {

    @Autowired
    private EmployeeRepository2 repository;

    public void printAllPermanentEmployees() {
        List<Employee2> list =
repository.getAllPermanentEmployeesWithFetch();
        System.out.println("---- HQL Permanent Employees ----");
```

```
        list.forEach(e -> {
            System.out.println("Employee: " + e.getName());
            System.out.println("Skills: " + e.getSkillList());
        });
    }

    public void printAllEmployeesNative() {
        List<Employee2> list = repository.getAllEmployeesNative();
        System.out.println("---- Native Query Employees ----");
        list.forEach(e -> System.out.println("Employee: " + e.getName()));
    }

    public double getAverageSalaryByDepartment(int id) {
        return repository.getAverageSalary(id);
    }
}
```

src/main/java/com/cognizant/orm_query_methods_demo/ OrmQueryMethodsDemoApplication2.java

```
package com.cognizant.orm_query_methods_demo;

import com.cognizant.orm_query_methods_demo.service.EmployeeService2;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.context.ApplicationContext;

@SpringBootApplication
public class OrmQueryMethodsDemoApplication2 {

    public static void main(String[] args) {
        ApplicationContext context =
SpringApplication.run(OrmQueryMethodsDemoApplication2.class, args);
        EmployeeService2 service = context.getBean(EmployeeService2.class);

        service.printAllPermanentEmployees();
        service.printAllEmployeesNative();
    }
}
```

Output: