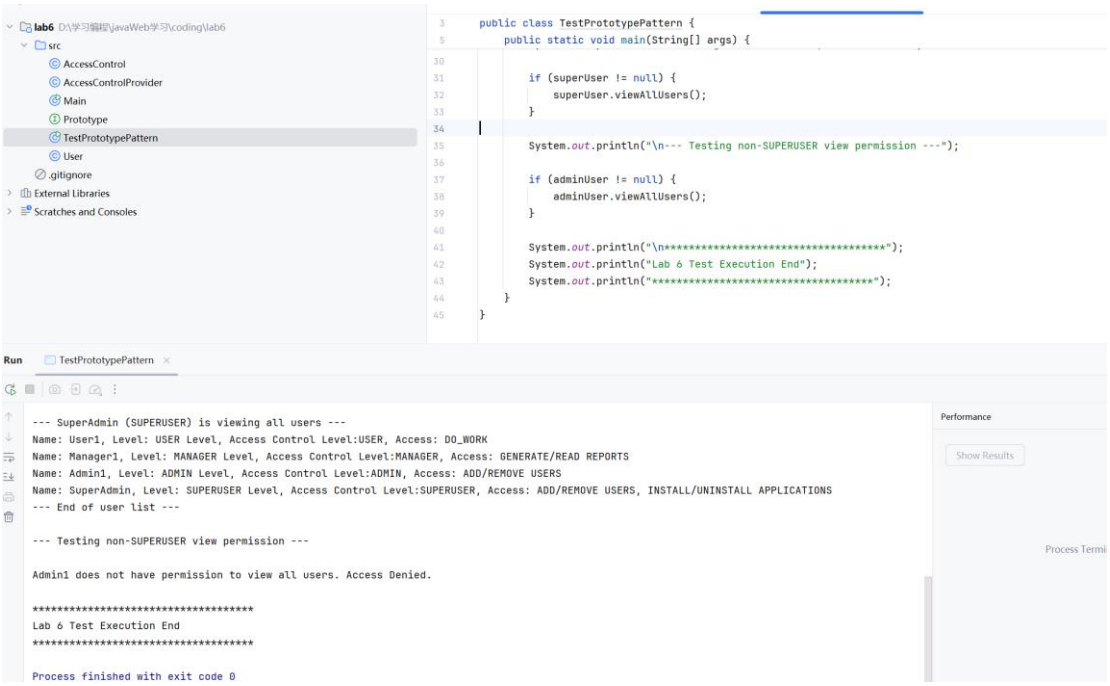
Result

```
************************************
Lab 6 Test Execution Start
************************************

Fetching data from external resources and creating access control objects...
Successfully created user: SuperAdmin
Successfully created user: Admin1
Successfully created user: Manager1
Successfully created user: User1

--- Initial Users ---
Name: SuperAdmin, Level: SUPERUSER Level, Access Control Level:SUPERUSER, Access: ADD/REMOVE USERS, INSTALL/UNINSTALL APPLICATIONS
Name: Admin1, Level: ADMIN Level, Access Control Level:ADMIN, Access: ADD/REMOVE USERS
Name: Manager1, Level: MANAGER Level, Access Control Level:MANAGER, Access: GENERATE/READ REPORTS
Name: User1, Level: USER Level, Access Control Level:USER, Access: DO_WORK
---------------------

--- Testing unique username constraint ---
ERROR: User with name 'Admin1' already exists. Cannot create user.
----------------------------------------

--- Testing SUPERUSER view permission ---

--- SuperAdmin (SUPERUSER) is viewing all users ---
Name: User1, Level: USER Level, Access Control Level:USER, Access: DO_WORK
Name: Manager1, Level: MANAGER Level, Access Control Level:MANAGER, Access: GENERATE/READ REPORTS
Name: Admin1, Level: ADMIN Level, Access Control Level:ADMIN, Access: ADD/REMOVE USERS
Name: SuperAdmin, Level: SUPERUSER Level, Access Control Level:SUPERUSER, Access: ADD/REMOVE USERS, INSTALL/UNINSTALL APPLICATIONS
--- End of user list ---

--- Testing non-SUPERUSER view permission ---

Admin1 does not have permission to view all users. Access Denied.

************************************
Lab 6 Test Execution End
```



Code changed

Class AccessControlProvider

```
    // new code added
    map.put("SUPERUSER", new AccessControl( controlLevel: "SUPERUSER",  access: "ADD/REMOVE USERS, INSTALL/UNINSTALL APPLICATIO
}
```

Add method

```
public static User createUser(String userName, String level) {  5 usages

    if (userRegistry.containsKey(userName)) {
        System.out.println("ERROR: User with name '" + userName + "' already exists. Cannot create user.");
        return null;
    }

    AccessControl accessControl = getAccessControlObject(level);
    if (accessControl == null) {
        System.out.println("ERROR: Invalid user level '" + level + "'.");
        return null;
    }

    User newUser = new User(userName,  level: level + " Level", accessControl);
    //
    userRegistry.put(userName, newUser);
    System.out.println("Successfully created user: " + userName);
    return newUser;
}
```

```
//
public static Collection<User> getAllUsers() {  1 usage
    return userRegistry.values();
}
```

In User Class

Add method

```
public void viewAllUsers() {
    if ("SUPERUSER".equals(this.getAccessControl().getControlLevel())) {
        System.out.println("\n--- " + this.userName + " (SUPERUSER) is viewing
        Collection<User> allUsers = AccessControlProvider.getAllUsers();
        for (User u : allUsers) {
            System.out.println(u); // 使用现有的toString()方法打印用户信息
        }
        System.out.println("--- End of user list ---");
    } else {
        System.out.println("\n" + this.userName + " does not have permission to
    }
}
```

Test Code

```
// TestPrototypePattern.java


public class TestPrototypePattern {


    public static void main(String[] args) {

        System.out.println("************************************");

        System.out.println("Lab 6 Test Execution Start");

        System.out.println("************************************\n");



        User superUser = AccessControlProvider.createUser("SuperAdmin", "SUPERUSER");

        User adminUser = AccessControlProvider.createUser("Admin1", "ADMIN");

        User managerUser = AccessControlProvider.createUser("Manager1", "MANAGER");

        User basicUser = AccessControlProvider.createUser("User1", "USER");


        System.out.println("\n--- Initial Users ---");

        System.out.println(superUser);

        System.out.println(adminUser);

        System.out.println(managerUser);

        System.out.println(basicUser);
```

```
System.out.println("---------------------\n");



System.out.println("--- Testing unique username constraint ---");

AccessControlProvider.createUser("Admin1", "USER");

System.out.println("----------------------------------------\n");

System.out.println("--- Testing SUPERUSER view permission ---");

if (superUser != null) {
    superUser.viewAllUsers();
}

System.out.println("\n--- Testing non-SUPERUSER view permission ---");

if (adminUser != null) {
    adminUser.viewAllUsers();
}

System.out.println("\n**********************************");
System.out.println("Lab 6 Test Execution End");
```

```
            System.out.println("***********************************");

        }

    }
```