Spring Boot Security

Introduction to Security Concepts:

Security of web application:

- It is process of enabling **Authentication + Authorization** on the web application.

Authentication:

- Checking the **IDENTITY USER** by using **usernames** and **passwords**, **thumb impressions, iris**, **digital signatures**, **OTP,** etc.

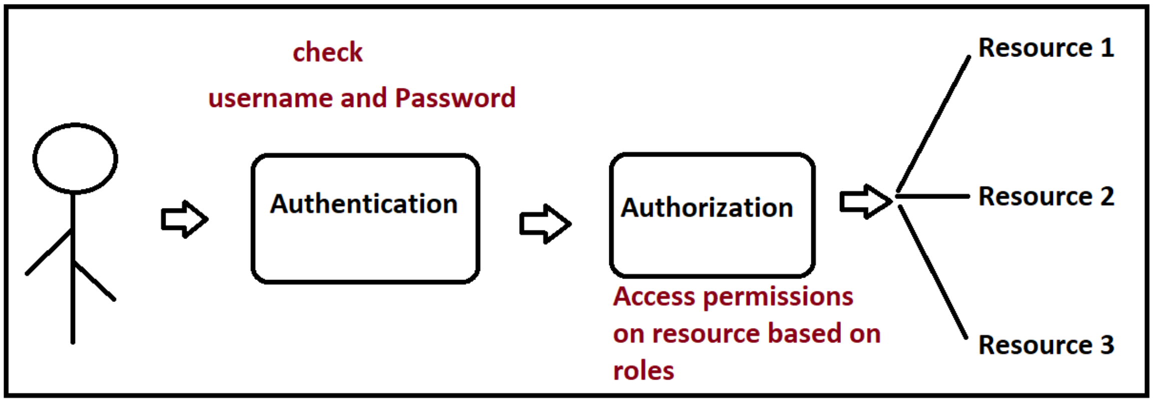
Authorization:

- Checking the access permissions of the authenticated users on resources of the application.
- Here the **roles** of the user will be verified before allowing the user to access resources of the application.
- **Roles** are nothing but designations given to the users.
- Based on the roles of the users, the access permissions on resources will be decided.
  Eg:

  All Customers and Employees of the bank must be authenticated to use **XYZ Bank Application**.
  The users having **Customer Role** will get less permission on the resources.
  The users having **Employee Role** will get more access permission on the resources.
- It is always recommended to enable **authorization** of accessing the resources based on **Roles of the users**, but not based on the username.
- During the authentication process, get the Roles of the users and use those roles for authorization.

Realm:

- It is a small database s/w or repository where **usernames, passwords and roles are managed.**



Authentication Providers:

- It is small realm where **usernames and passwords, and roles** are managed and will be used during Authentication and Authorization.

- The following are the different Authentication Providers.
    1. Properties file
    2. XML file
    3. JSON file
    4. DB s/w
    5. LDAP Server (Lightweight Directory Access Protocol)
    6. In-Memory DB

Authentication and Authorization Manager:

- It is the component which verifies the given **username** and **password** to perform Authentication and give **401 error code** if authentication fails.

- It also collects the roles of authenticated users and performs Authorization activities on access resources and gives **403 error** if authorization fails.

- **Authentication and Authorization Manager** are provided by **Spring Security or Spring Boot Security**.

Authorization Levels in Spring Security:

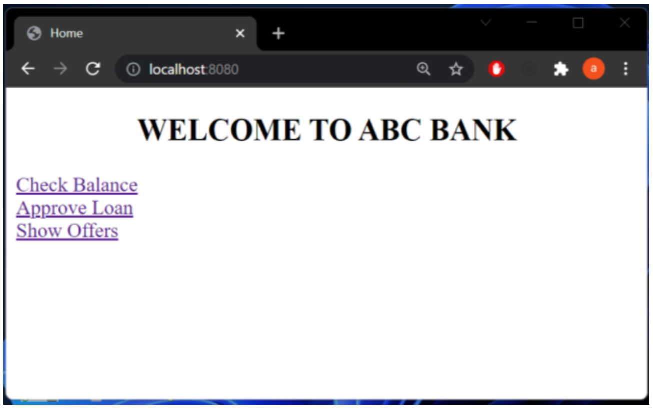
1. **permitAll():**
   No Authentication + No Authorization (No Role Checking)
   Eg:
   Home page, About Us page, Contact Us page, etc

2. **authenticate():**
   Only Authentication on the given request url resource (controller) and no Authorization (no role checking)
   Eg:
   Main Menu page, Inbox page, Compose page, etc.

3. **hasRole():**
   Authentication + Authorization (Role Checking ("USER"))
   Eg:
   Checking Balance page, Transfer Money page, Withdraw or Deposit money page, etc

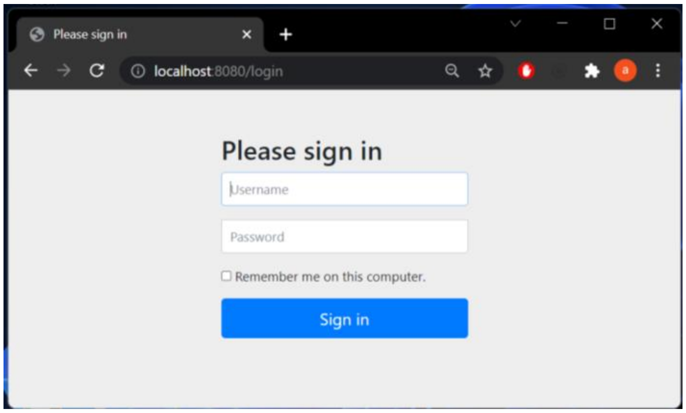
4. **hasAnyRole():**
   Authentication + Authorization (Any one Role should be there in the list of given roles ("USER", "MANAGER")
   Eg:
   Checking Balance page, Transfer Money page, Withdraw or Deposit money page, etc

USE CASE:



WELCOME TO ABC BANK

Check Balance
Approve Loan
Show Offers



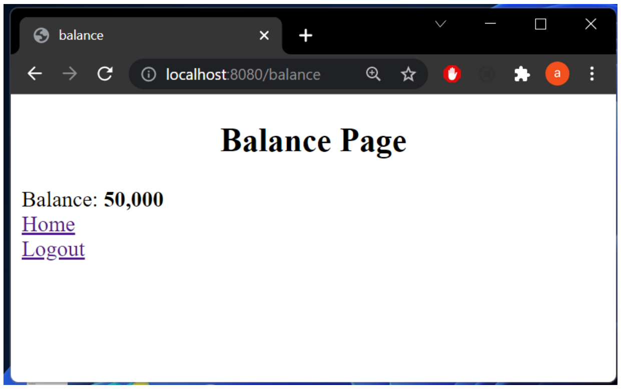
Please sign in

Username

Password

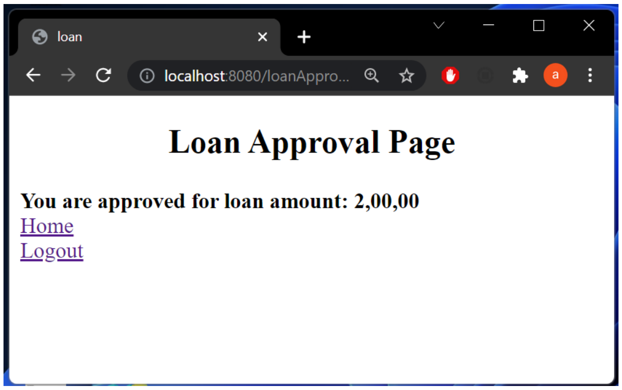
□ Remember me on this computer.

Sign in



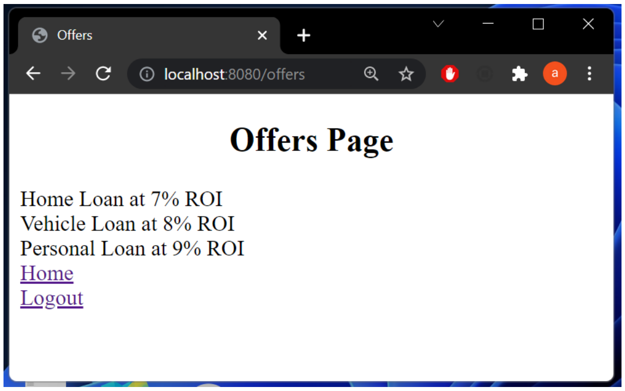
Balance Page

Balance: **50,000**
Home
Logout



Loan Approval Page

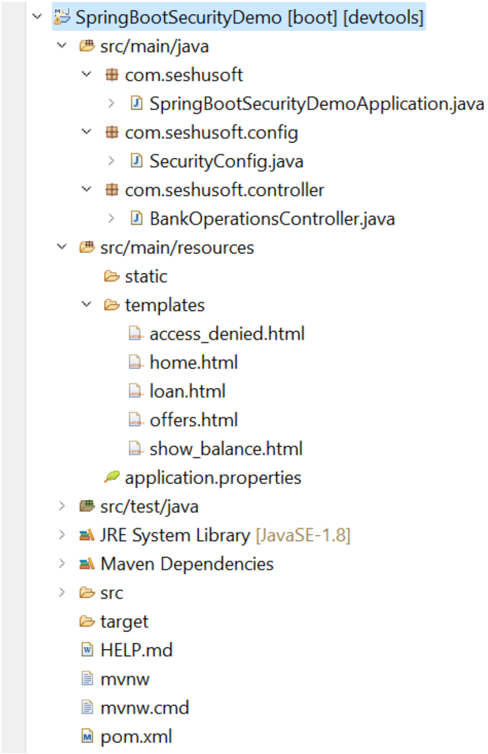
You are approved for loan amount: 2,00,00
Home
Logout



Offers Page

Home Loan at 7% ROI
Vehicle Loan at 8% ROI
Personal Loan at 9% ROI
Home
Logout

Create Spring Starter project
Dependencies: Spring dev tools, Spring Web, Spring Security, thymeleaf



```
SpringBootSecurityDemo [boot] [devtools]
  src/main/java
    com.seshusoft
      SpringBootSecurityDemoApplication.java
    com.seshusoft.config
      SecurityConfig.java
    com.seshusoft.controller
      BankOperationsController.java
  src/main/resources
    static
    templates
      access_denied.html
      home.html
      loan.html
      offers.html
      show_balance.html
    application.properties
  src/test/java
  JRE System Library [JavaSE-1.8]
  Maven Dependencies
  src
  target
  HELP.md
  mvnw
  mvnw.cmd
  pom.xml
```

home.html

```html
<!DOCTYPE html>
<html>
<head>
    <title>Home</title>
</head>
<body>
<h2 style="text-align: center;">WELCOME TO ABC BANK</h2>
    <a href="balance">Check Balance</a>
    <br>
    <a href="loanApprove">Approve Loan</a>
    <br>
    <a href="offers">Show Offers</a>
</body>
</html>
```

access_denied.html

```
<!DOCTYPE html>
<html>
<head>
    <title>access_denied</title>
</head>
<body>
<h2 style="text-align: center;">Access Denied Page</h2>
<a href="./">Home</a>
</body>
</html>
```

loan.html

```
<!DOCTYPE html>
<html>
<head>
    <title>loan</title>
</head>
<body>
<h2 style="text-align: center;">Loan Approval Page</h2>
    <b>You are approved for loan amount: 2,00,00</b>
    <br>
    <a href="./">Home</a>
    <br>
    <a href="logout">Logout</a>
</body>
</html>
```

offers.html

```
<!DOCTYPE html>
<html>
<head>
    <title>Offers</title>
</head>
<body>
<h2 style="text-align: center;">Offers Page</h2>
    Home Loan at 7% ROI
    <br>
    Vehicle Loan at 8% ROI
    <br>
    Personal Loan at 9% ROI
    <br>
    <a href="./">Home</a>
     <br>
    <a href="logout">Logout</a>
</body>
</html>
```

show_balance.html

```
<!DOCTYPE html>
<html>
<head>
    <title>balance</title>
</head>
<body>
<h2 style="text-align: center;">Balance Page</h2>
    Balance: <b>50,000</b>
    <br>
    <a href="./">Home</a>
    <br>
    <a href="logout">Logout</a>
</body>
</html>
```

BankOperationsController.java

```java
package com.seshusoft.controller;

import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;

@Controller
public class BankOperationsController {
	@GetMapping("/")
	public String showHome() {
		return "home";
	}

	@GetMapping("/offers")
	public String showOffers() {
		return "offers";
	}

	@GetMapping("/balance")
	public String showBalance() {
		return "show_balance";
	}

	@GetMapping("/loanApprove")
	public String approveLoan() {
		return "loan";
	}

	@GetMapping("/denied")
	public String accessDenied() {
		return "access_denied";
	}
}
```

SecurityConfig.java

```
package com.seshusoft.config;

import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;
import 
org.springframework.security.config.annotation.authentication.builders.AuthenticationManagerBuil
der;
import org.springframework.security.config.annotation.web.builders.HttpSecurity;
import org.springframework.security.config.annotation.web.configuration.EnableWebSecurity;
import 
org.springframework.security.config.annotation.web.configuration.WebSecurityConfigurerAdapter;
import org.springframework.security.crypto.bcrypt.BCryptPasswordEncoder;
import org.springframework.security.crypto.password.PasswordEncoder;

@Configuration
@EnableWebSecurity
public class SecurityConfig extends WebSecurityConfigurerAdapter{

       @Bean
       public PasswordEncoder encoder() {
           return new BCryptPasswordEncoder();
       }

       @Override
       public void configure(AuthenticationManagerBuilder auth) throws Exception {
             auth.inMemoryAuthentication()
                    .withUser("adi")
                    .password(encoder().encode("adi123"))
                    .roles("CUSTOMER");
             auth.inMemoryAuthentication()
                    .withUser("seshu")
                    .password(encoder().encode("seshu123"))
                    .roles("MANAGER");
       }

       @Override
       public void configure(HttpSecurity http) throws Exception {
             http.authorizeRequests()
             //No authentication and No authorization
             .antMatchers("/").permitAll()

             //Only Athentication
             .antMatchers("/offers").authenticated()

             //authentication + authorization for "CUSTOMER", "MANAGER" role users
             .antMatchers("/balance").hasAnyRole("CUSTOMER","MANAGER")

             //authentication + authorization for "MANAGER" role user
             .antMatchers("/loanApprove").hasRole("MANAGER")

             //remaining all request urls must be authenticated
             .anyRequest().authenticated()

             //authentication mode
             .and().formLogin()
```

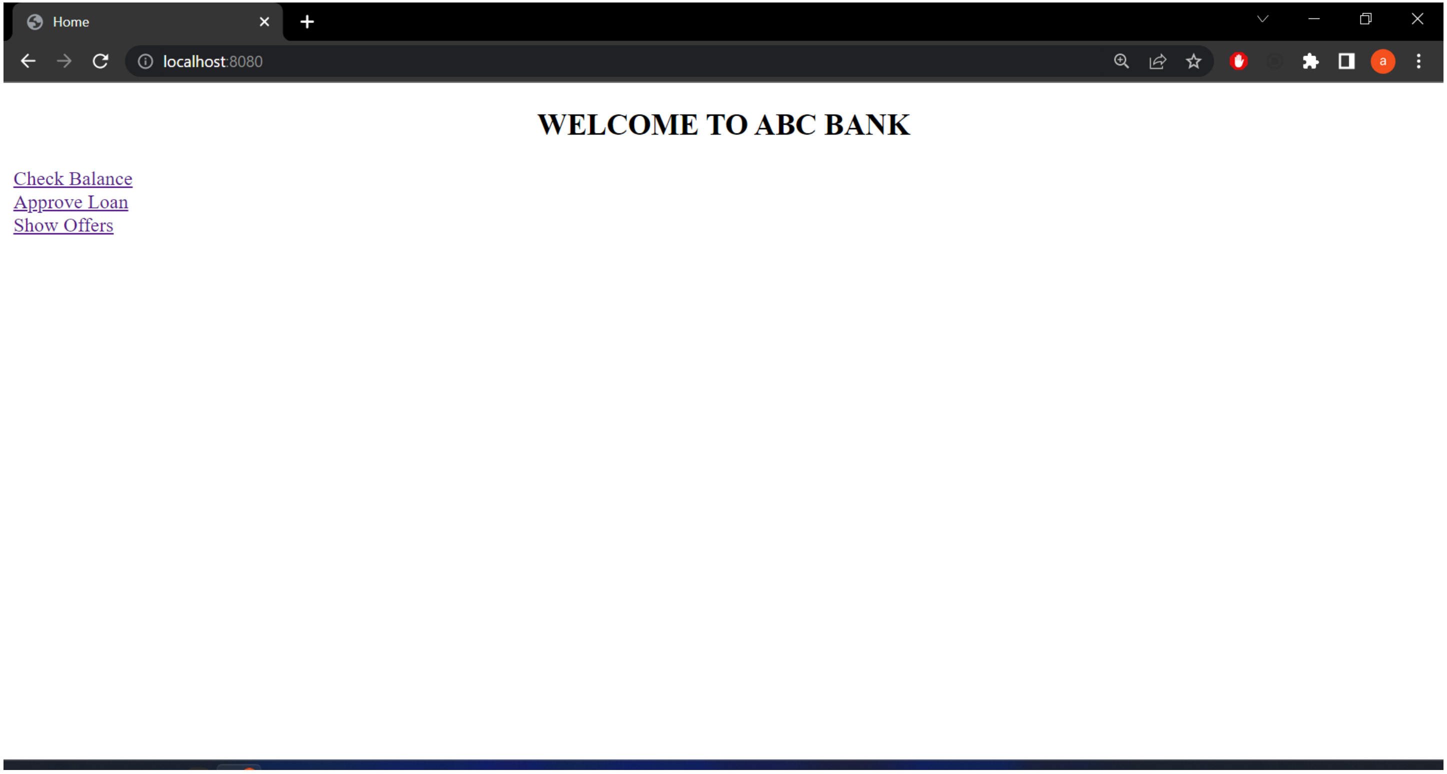
```
                .and().rememberMe()

                .and().logout().permitAll()

                //error handling
                .and().exceptionHandling().accessDeniedPage("/denied");
        }
}
```

Run Starter class

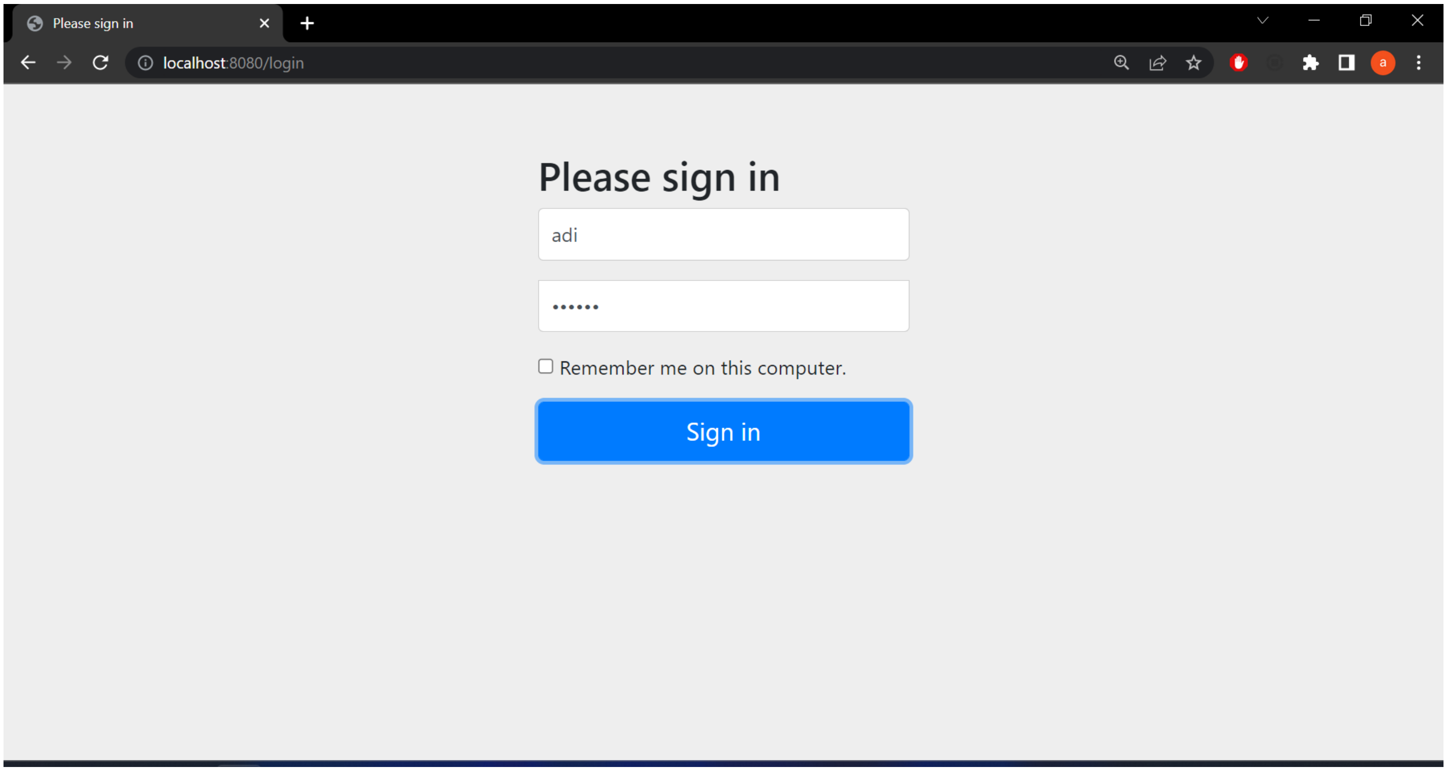
http://localhost:8080/



WELCOME TO ABC BANK

Check Balance
Approve Loan
Show Offers

Click on Check Balance link
Provide credentials
Username : adi
Password: adi123

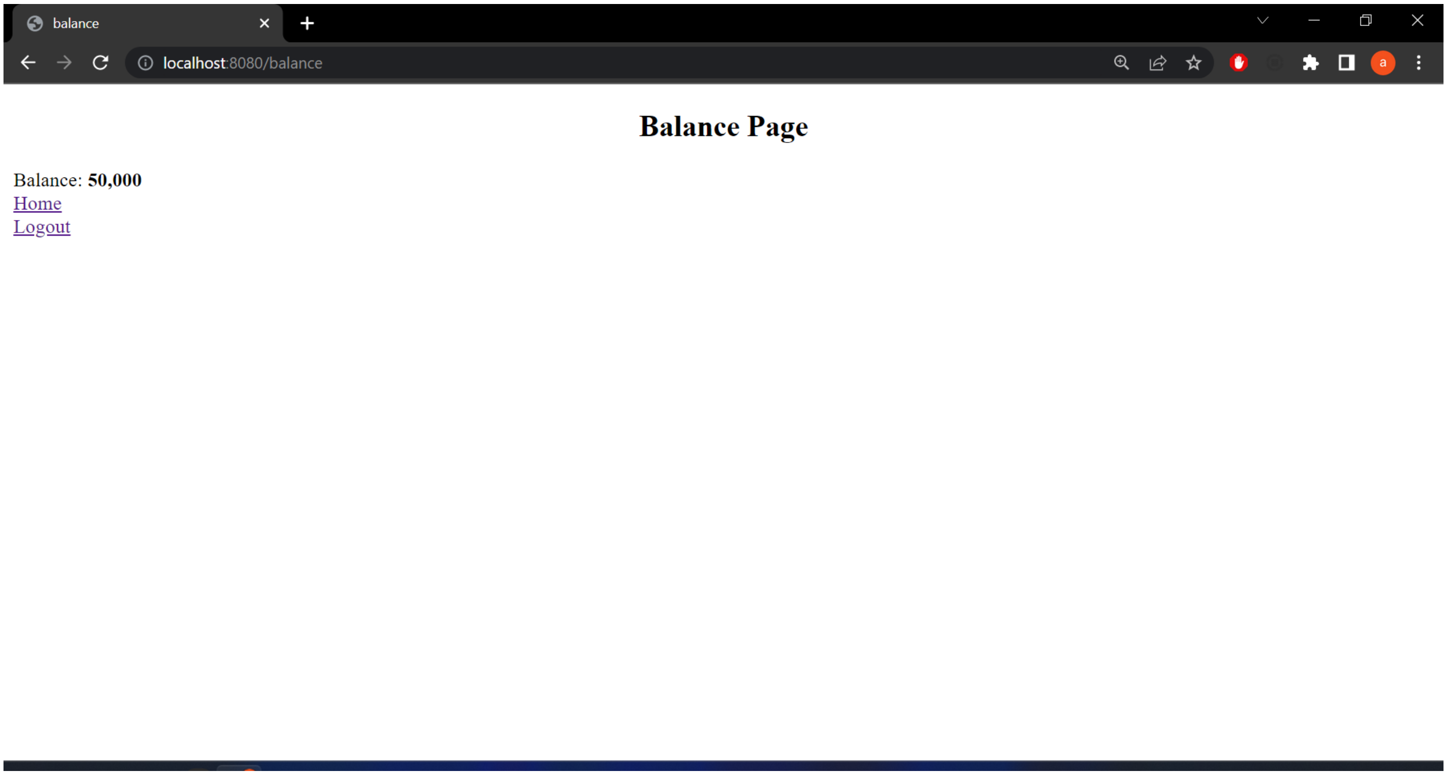


Please sign in

adi

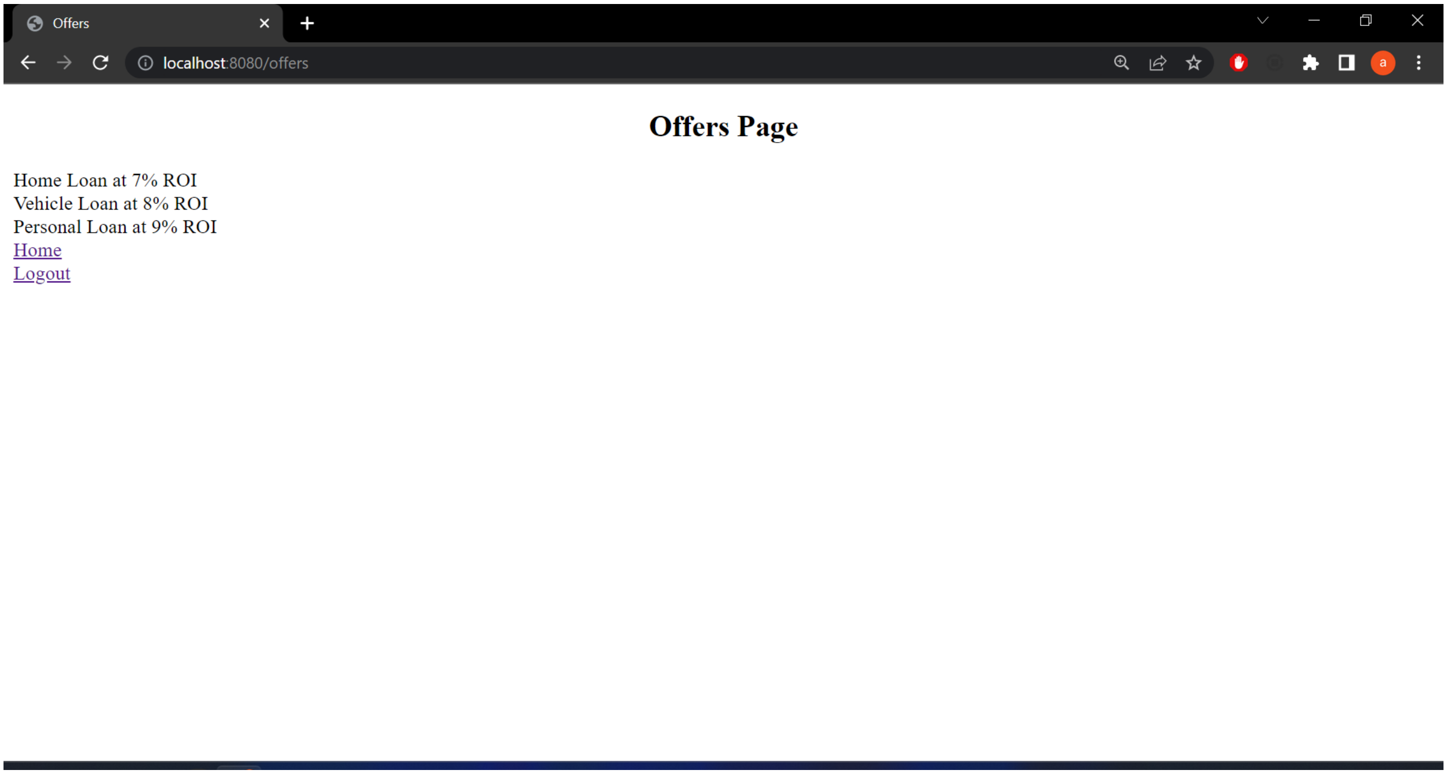
••••••

□ Remember me on this computer.



Balance Page

Balance: **50,000**
Home
Logout



Offers Page

Home Loan at 7% ROI
Vehicle Loan at 8% ROI
Personal Loan at 9% ROI
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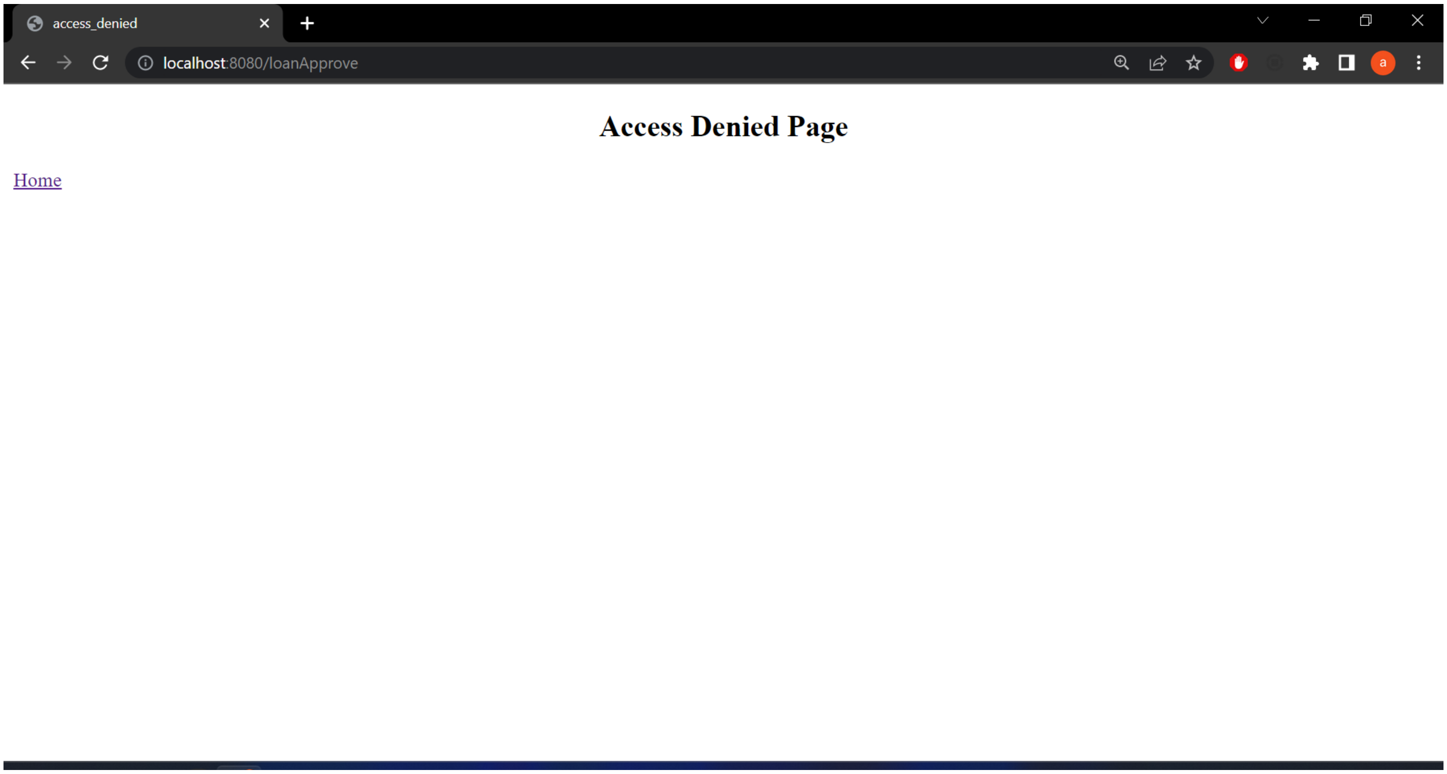
Logout

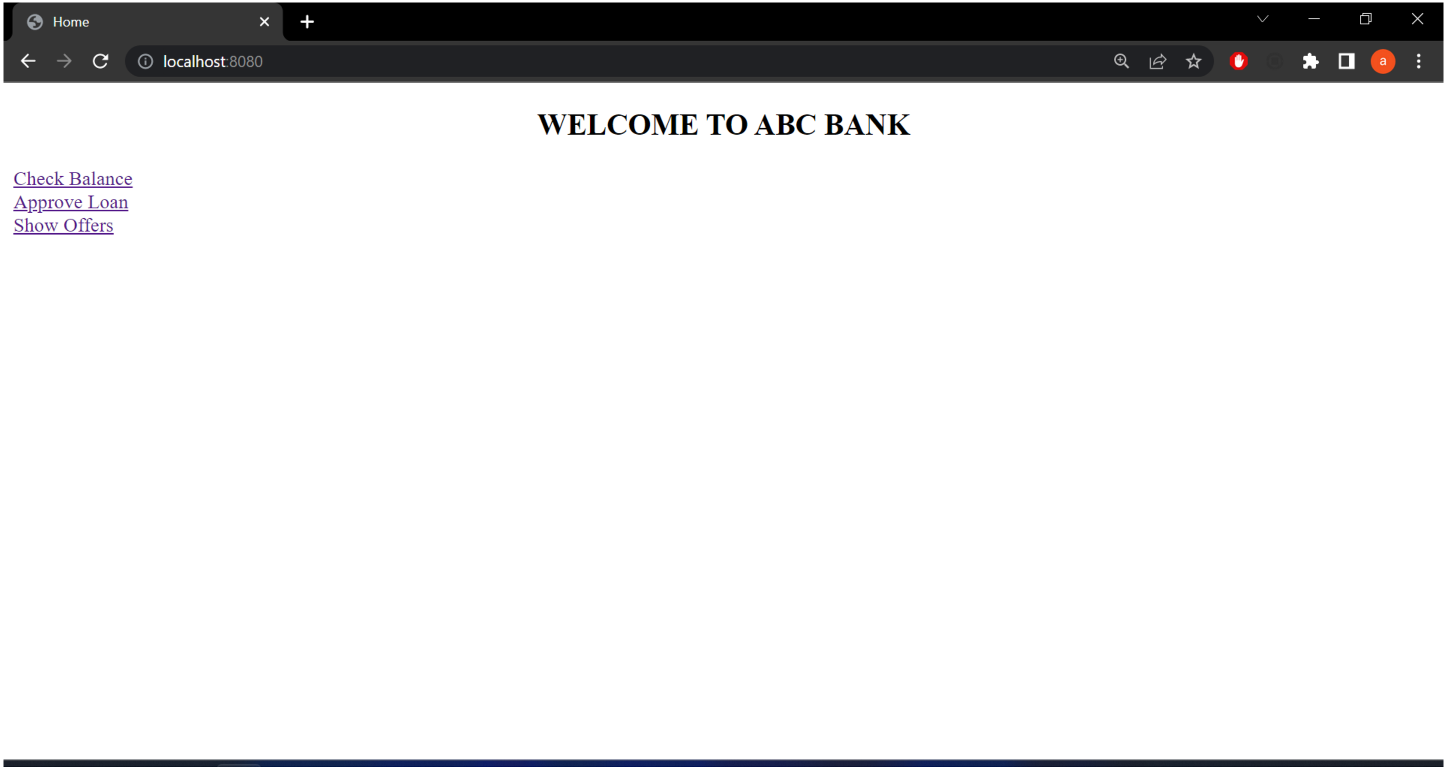
Click on Approve Loan link
As the user adi having only CUSTOMER role, not able to access Approve Loan link.



Access Denied Page

Home

Click Home and Logout.



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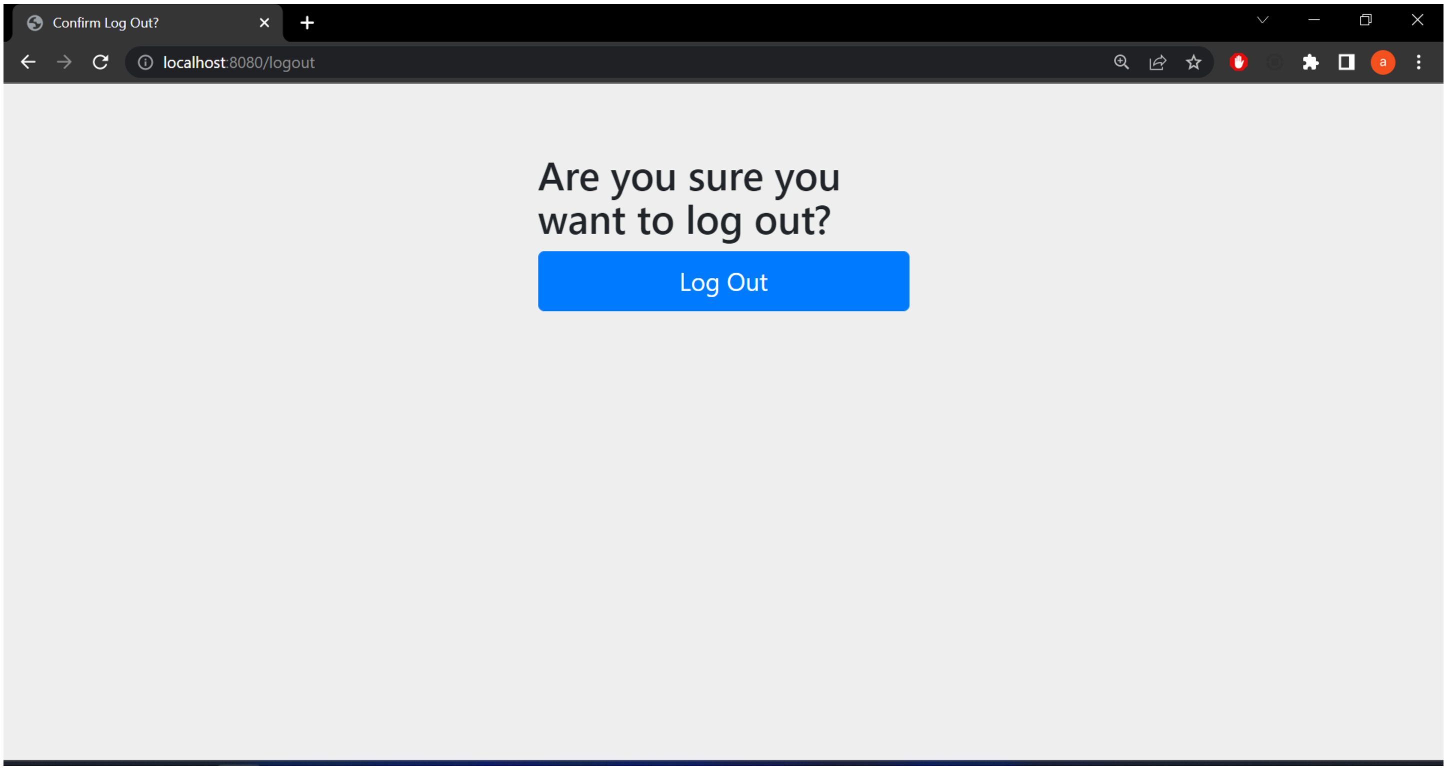
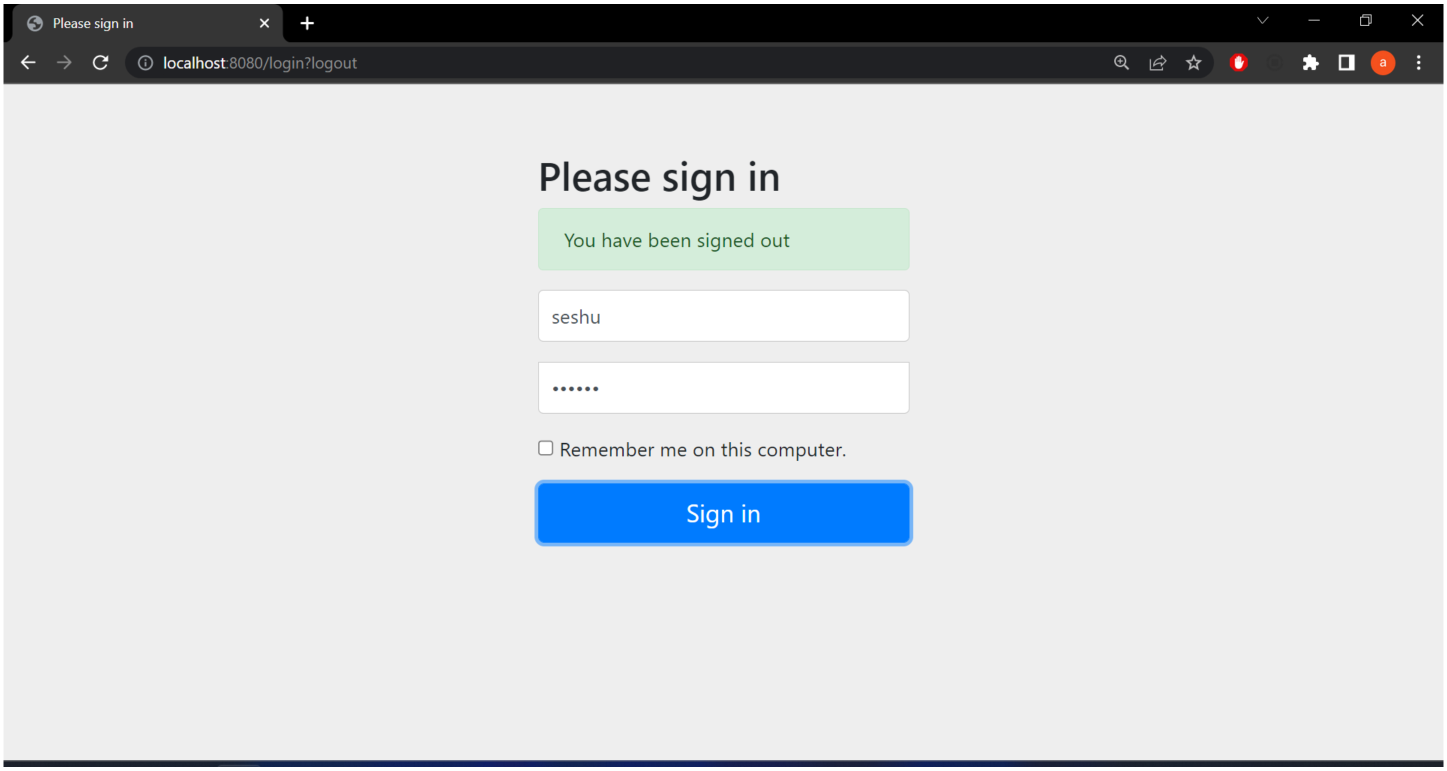
Show Offers



Are you sure you want to log out?

Log Out

Once again login with credentials
Username: seshu
Password: seshu123



Please sign in

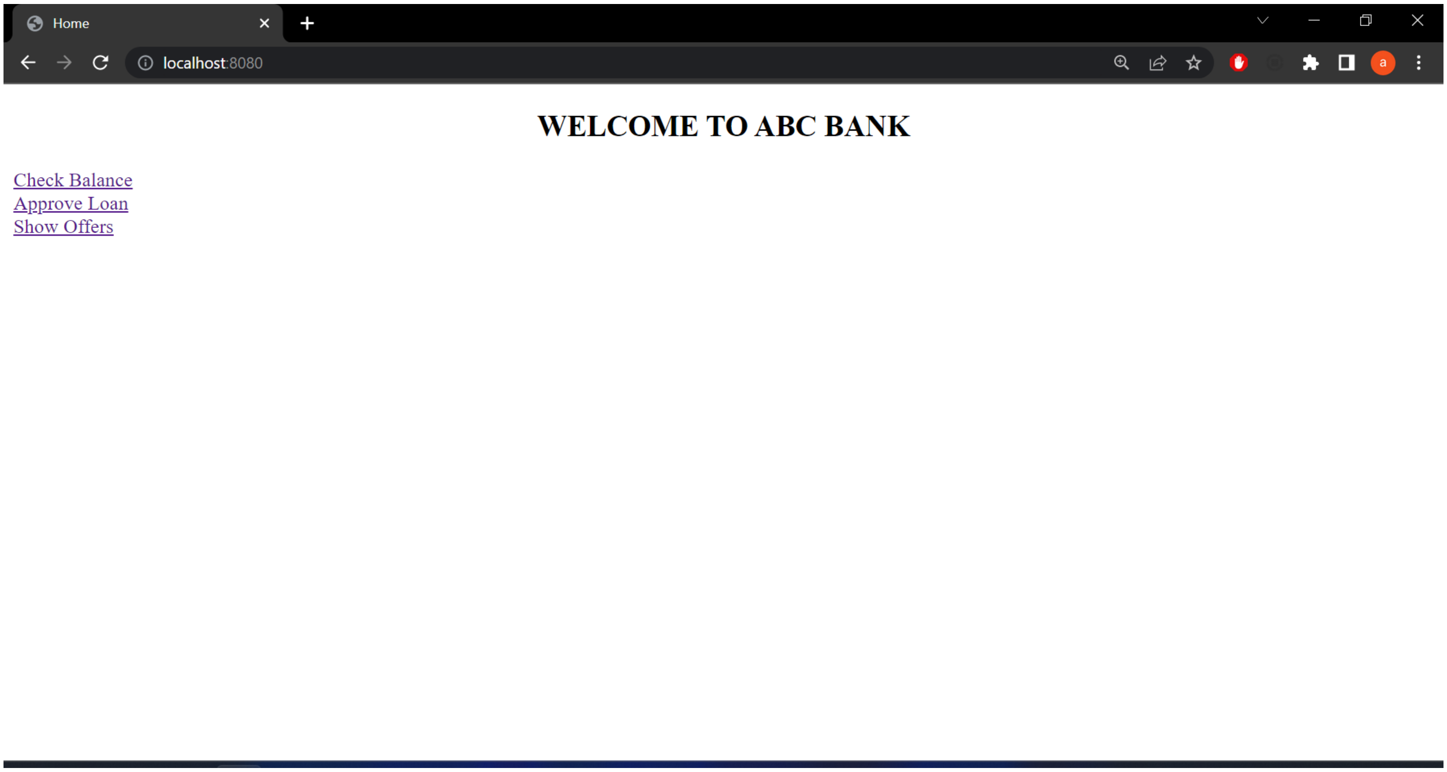
You have been signed out

seshu

••••••

□ Remember me on this computer.

Now, click on Approve Loan



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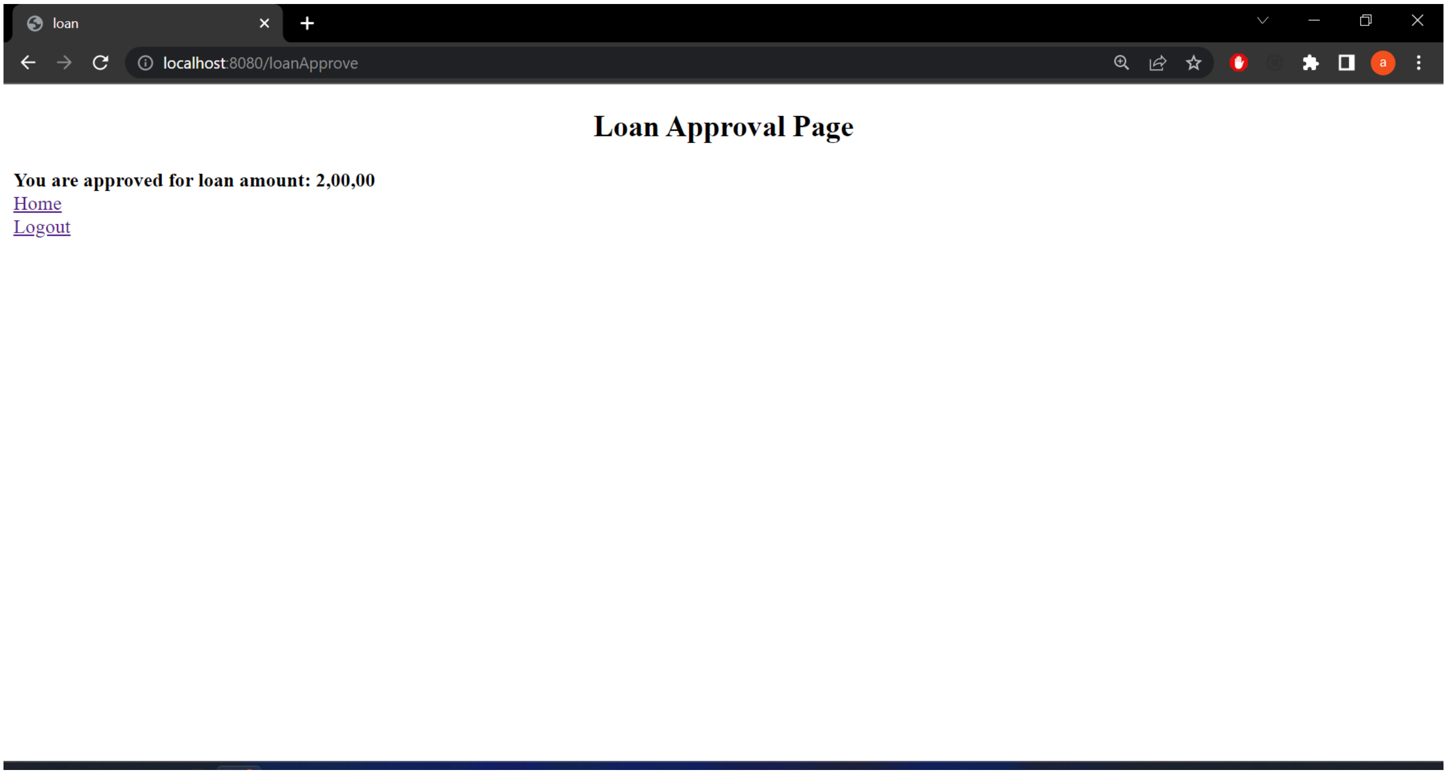

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