Answer to the Question No. 1

Employee Class:

```
public class Employee {
    String name;
    String ID;
    double salary;

    Employee(String name, String ID, double salary){
        this.name = name;
        this.ID = ID;
        this.salary = salary;
    }

    void work(){
        System.out.println("Employee "+name + " is working");
    }
    double calculateBonus(double performanceRating){
      return salary*0.15*performanceRating;
    }
}
```

Manager Class:

```
public class Manager extends Employee {
    int teamSize;
    String department;

    Manager(String name, String ID, double salary, int teamSize, String department){
        super(name,ID,salary);
        this.teamSize = teamSize;
```

```
        this.department = department;
    }
    @Override
    void work(){
        System.out.println("Manager "+ name+" is managing the "+department+" department, with a team of "+teamSize+" employees");
    }
    @Override
    double calculateBonus(double performanceRating){
      return salary*0.2*performanceRating;
    }
    void evaluateTeamPerformance(){
        System.out.println("Manager "+ name+" is evaluating the performance of the team of the department: "+department);
    }
    void conductTeamMeeting(){
        System.out.println("Manager "+ name+" is conducting a team meeting for the "+department+" department");
    }
}
```

Director Class:

```
public class Director extends Manager {
    int numberOfDepartments;

    Director(String name, String ID, double salary, int teamSize, String department, int numberOfDepartments){
        super(name,ID,salary,teamSize,department);
        this.numberOfDepartments = numberOfDepartments;
    }
```

```
    @Override
    void work(){
        System.out.println("Director "+ name+" is overseeing "+numberOfDepartments+" departments and setting company strategies");
    }
    @Override
    double calculateBonus(double performanceRating){
      return salary*0.25*performanceRating;
    }

    void setCompanyStrategy(){
        System.out.println("Director "+name+" is setting the company strategy");
    }

    void evaluateManagers(){
        System.out.println("Director "+name+" is evaluating "+numberOfDepartments+" managers");
    }
}
```

Main Class:

```
public class LabAssignment {

    public static void main(String[] args) {
        Employee e = new Employee("Omar", "2023", 10000);
        Manager m = new Manager("Tasin", "2024", 20000,5,"A");
        Director d = new Director("Kayes", "2025", 30000,10,"B", 5);
```

```
        System.out.println("Employee details:");
        e.work();
        System.out.println("Bonus for employee "+e.name+": "+e.calculateBonus(0.5));

        System.out.println();
        System.out.println("Manager details:");
        m.work();
        System.out.println("Bonus for manager "+m.name+": "+m.calculateBonus(0.6));
        m.evaluateTeamPerformance();
        m.conductTeamMeeting();

        System.out.println();
        System.out.println("Director details:");
        d.work();
        System.out.println("Bonus for director "+d.name+": "+d.calculateBonus(0.7));
        d.setCompanyStrategy();
        d.evaluateManagers();

    }
}
```

Output:

```
Employee details:
Employee Omar is working
Bonus for employee Omar: 750.0

Manager details:
Manager Tasin is managing the A department, with a team of 5 employees
Bonus for manager Tasin: 2400.0
Manager Tasin is evaluating the performance of the team of the department: A
Manager Tasin is conducting a team meeting for the A department

Director details:
Director Kayes is overseeing 5 departments and setting company strategies
Bonus for director Kayes: 5250.0
Director Kayes is setting the company strategy
Director Kayes is evaluating 5 managers
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  0.878 s
Finished at: 2025-05-31T11:26:41+06:00
------------------------------------------------------------------------
```

Answer to the Question No. 2

AbstractUser Class:

```
public abstract class AbstractUser {
    abstract void login();
    abstract void logout();
    abstract void viewProfile();
}
```

BookHandler Interface:

```
public interface BookHandler {
    void borrowBook(String title);
    void returnBook(String title);
    void addBook(String title);
    void removeBook(String title);
    void manageBook(String title);
}
```

BookList Class:

```
public class BookList {
    public static List<String> books = new ArrayList<>();
    public static void showBooks(){
        System.out.print("Books currently available: ");
        for(String book: books){
            System.out.print(book + ", ");
        }
        System.out.println();
    }
}
```

LoggedInUsers Class:

```
public class LoggedInUsers {
    public static HashMap<String, String> users = new HashMap<>();

    public static void addUser(String id, String password) {
        users.put(id, password);

    }

    public static void removeUser(String id, String password) {
        if (password.equals(users.get(id))) {
            users.remove(id);

        }
    }

    public static void printAllUsers() {
        if (users.isEmpty()) {
            System.out.println("No users are currently logged in.");
            return;
        }

        System.out.println("Logged-in users:");
        for (Map.Entry<String, String> entry : users.entrySet()) {
            System.out.println("ID: " + entry.getKey() + ", Password: " + entry.getValue());
        }
    }
}
```

Member Class:

```
public class Member extends AbstractUser implements BookHandler {
    String ID;
    String password;
    Member(String ID, String password){
        this.ID = ID;
        this.password = password;
    }
    @Override
    void login(){
        System.out.println("Member with ID - "+ID+" and password - "+password+" has logged
in");
        LoggedInUsers.addUser(ID, password);
    }
    @Override
    void logout(){
        System.out.println("Member with ID - "+ID+" and password - "+password+" has logged
out");
        LoggedInUsers.removeUser(ID, password);
    }
    @Override
    void viewProfile(){
        System.out.println("Member with ID - "+ID+" and password - "+password+" is viewing
profile");
    }
    @Override
    public void borrowBook(String title){
        System.out.println("Member with ID - "+ID+" has borrowed the book titled: "+title);
        BookList.books.remove(title);
```

```
    }
    @Override
    public void returnBook(String title){
        System.out.println("Member with ID - "+ID+" has returned the book titled: "+title);
        BookList.books.add(title);
    }
    @Override
    public void addBook(String title){
        System.out.println("Sorry, members are not eligible for this action");
    }
    @Override
    public void removeBook(String title){
        System.out.println("Sorry, members are not eligible for this action");
    }
    @Override
    public void manageBook(String title){
        System.out.println("Sorry, members are not eligible for this action");
    }

}
```

Librarian Class:

```
public class Librarian extends AbstractUser implements BookHandler {
    String ID;
    String password;
    Librarian(String ID, String password){
        this.ID = ID;
        this.password = password;
```

```
    }
    @Override
    void login(){
        System.out.println("Librarian with ID - "+ID+" and password - "+password+" has logged in");
        LoggedInUsers.addUser(ID, password);
    }
    @Override
    void logout(){
        System.out.println("Librarian with ID - "+ID+" and password - "+password+" has logged out");
        LoggedInUsers.removeUser(ID, password);
    }
    @Override
    void viewProfile(){
        System.out.println("Librarian with ID - "+ID+" and password - "+password+" is viewing profile");
    }
    @Override
    public void borrowBook(String title){
        System.out.println("Sorry, librarians cannot perform this action");
    }
    @Override
    public void returnBook(String title){
        System.out.println("Sorry, librarians cannot perform this action");
    }
    @Override
    public void addBook(String title){
        System.out.println("Librarian with ID - "+ID+" has added the book titled: "+title);
```

```
        BookList.books.add(title);
    }
    @Override
    public void removeBook(String title){
        System.out.println("Librarian with ID - "+ID+" has removed the book titled: "+title);
        BookList.books.remove(title);
    }
    @Override
    public void manageBook(String title){
        System.out.println("Librarian with ID - "+ID+" has managed the book titled: "+title);
    }
}
```

Main Class:

```
public class LabAssignmentQ2 {
    public static void main(String[] args) {
        Librarian Omar = new Librarian("000","123");


        Omar.login();
        Omar.viewProfile();
        Omar.addBook("A");
        Omar.addBook("B");
        Omar.addBook("C");
        Omar.removeBook("C");
        Omar.borrowBook("A");
        Omar.returnBook("A");
        Omar.manageBook("A");
        Omar.logout();
```

```
BookList.showBooks();

Member Tasin = new Member("001","456");
Tasin.login();
Tasin.viewProfile();
Tasin.borrowBook("A");

BookList.showBooks();

Tasin.returnBook("A");
Tasin.addBook("D");
Tasin.removeBook("A");
Tasin.manageBook("A");
Tasin.logout();

Member Kayes = new Member("002","789");
Member Aoyon = new Member("003","987");
Kayes.login();
Aoyon.login();

LoggedInUsers.printAllUsers();

Kayes.logout();

Librarian Tamim = new Librarian("004","654");
Librarian Nouman = new Librarian("005","321");
Librarian Rakin = new Librarian("006","000");
```

```
        Tamim.login();
        Nouman.login();
        Rakin.login();

        LoggedInUsers.printAllUsers();

    }
}
```

Output:

```
Librarian with ID - 000 and password - 123 has logged in
Librarian with ID - 000 and password - 123 is viewing profile
Librarian with ID - 000 has added the book titled: A
Librarian with ID - 000 has added the book titled: B
Librarian with ID - 000 has added the book titled: C
Librarian with ID - 000 has removed the book titled: C
Sorry, librarians cannot perform this action
Sorry, librarians cannot perform this action
Librarian with ID - 000 has managed the book titled: A
Librarian with ID - 000 and password - 123 has logged out
Books currently available: A, B,
Member with ID - 001 and password - 456 has logged in
Member with ID - 001 and password - 456 is viewing profile
Member with ID - 001 has borrowed the book titled: A
Books currently available: B,
Member with ID - 001 has returned the book titled: A
Sorry, members are not eligible for this action
Sorry, members are not eligible for this action
Sorry, members are not eligible for this action
Member with ID - 001 and password - 456 has logged out
Member with ID - 002 and password - 789 has logged in
Member with ID - 003 and password - 987 has logged in
Logged-in users:
ID: 002, Password: 789
ID: 003, Password: 987
Member with ID - 002 and password - 789 has logged out
Librarian with ID - 004 and password - 654 has logged in
Librarian with ID - 005 and password - 321 has logged in
Librarian with ID - 006 and password - 000 has logged in
Logged-in users:
ID: 003, Password: 987
ID: 004, Password: 654
ID: 005, Password: 321
ID: 006, Password: 000
```