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CS5054NI Advanced Programming & Technologies

Assessment Type
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Semester
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Project Title: Smart Watch Ecommerce Website (WatchKart)

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Submitted to: Mr. Prithivi Maharjan

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I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

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1. Introduction:

The project deals with the development of an e-commerce website for electronic and gadgets, focusing on Model-View-Controller (MVC) pattern. The selected e-commerce website for dynamic web-project is a "**Smart Watch e-commerce Website**", named as "**Watchkart**".

1.1. Aim:

To develop a dynamic e-commerce website for electronics and gadgets category using advance programming in java.

1.2. objectives:

The major objectives of this project are implementation of MVC pattern for project, Integration of Login feature functionality with redirection and authentication mechanisms along with sessions and cookies management, Development of Admin panel features with product management and order management functionalities, Development of UI for users that enables managing their profiles, interact with products, cart functionality and others.

2. User Interface Design:

2.1. Wireframes:

A wire frame is designed to define a skeletal layout of a digital product to visualize and communicate the structure of a product or website (Balsamiq, 2024).

The wireframes of different pages of website are as follows:

i. Sign UP:

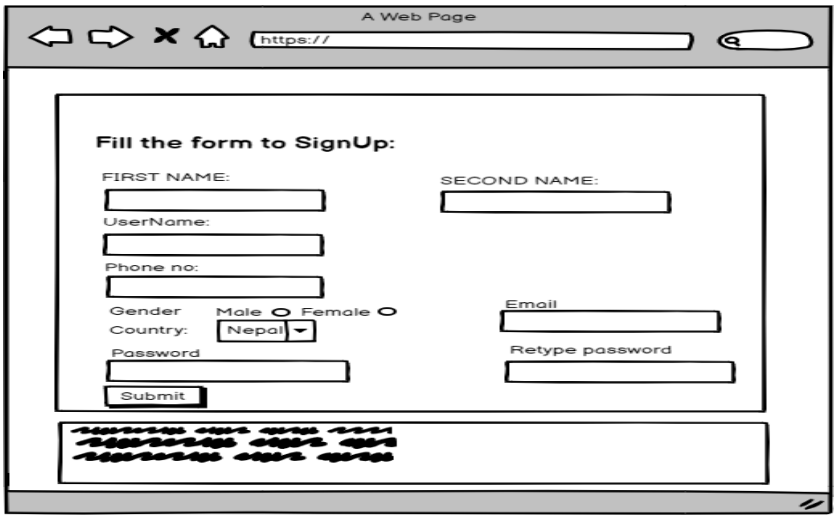


Figure 1: Wireframe 1: Signup

ii. Login user:

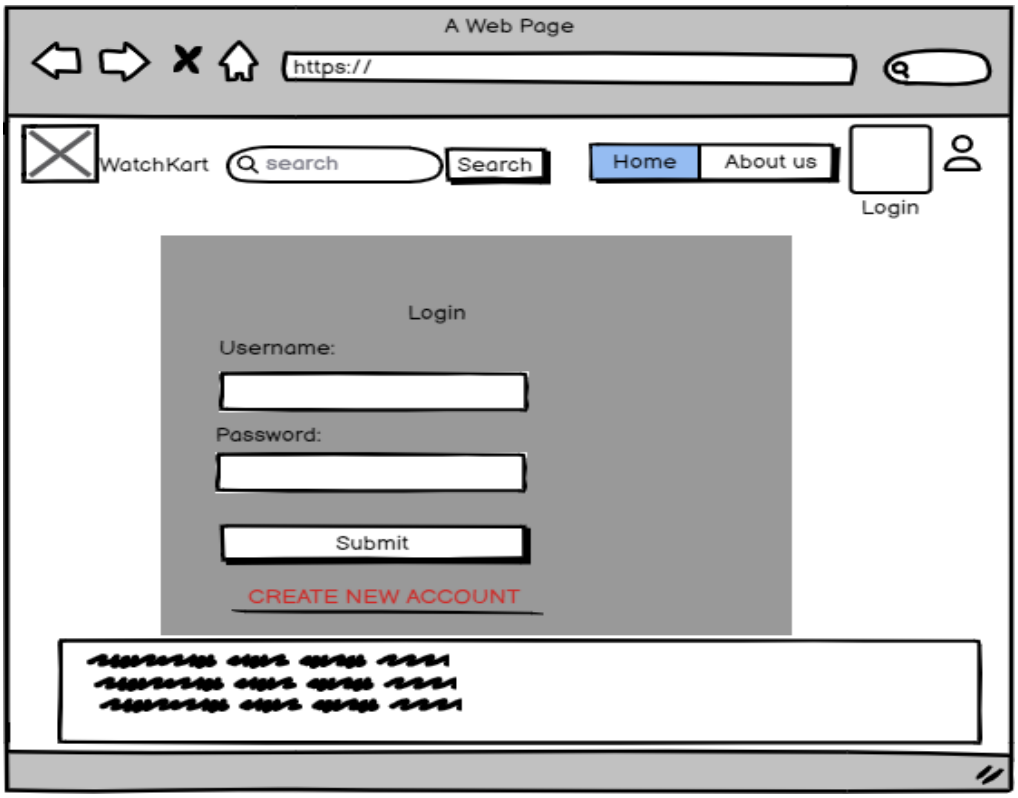


Figure 2:Wireframe 2: Login

iii. Home:

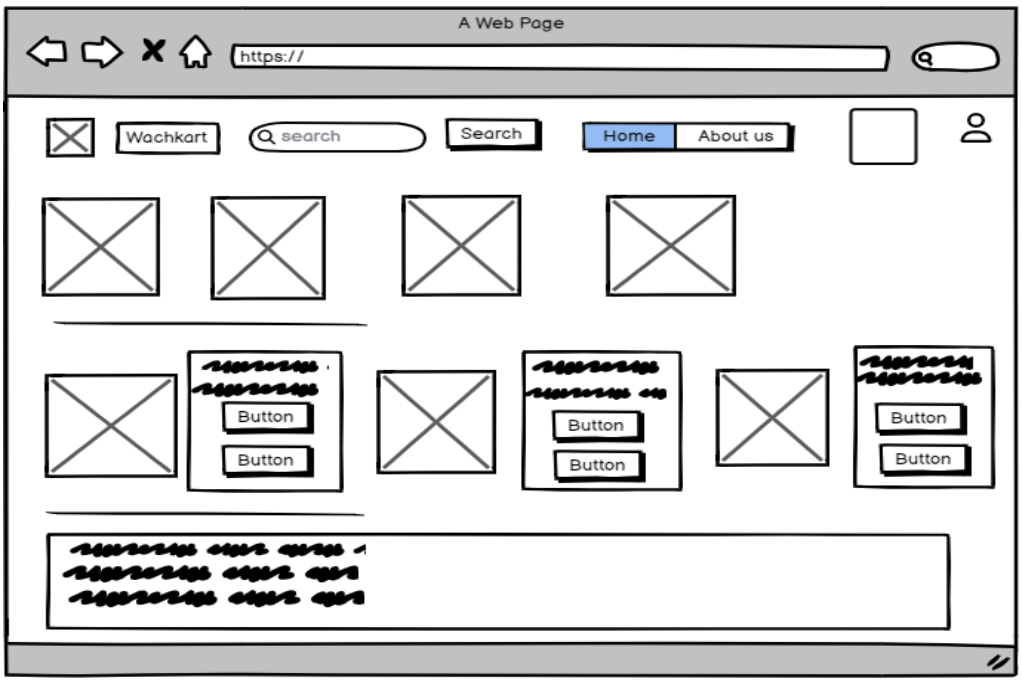


Figure 3: Wireframe 3: Home

iv. User profile:

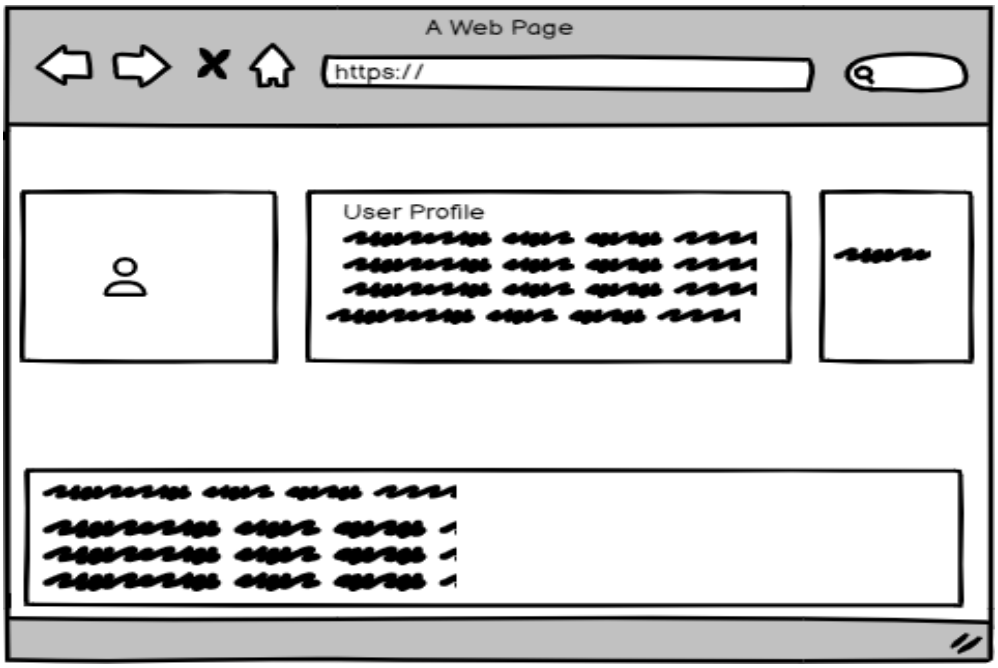


Figure 4: Wireframe 4: User Profile

v. About US:

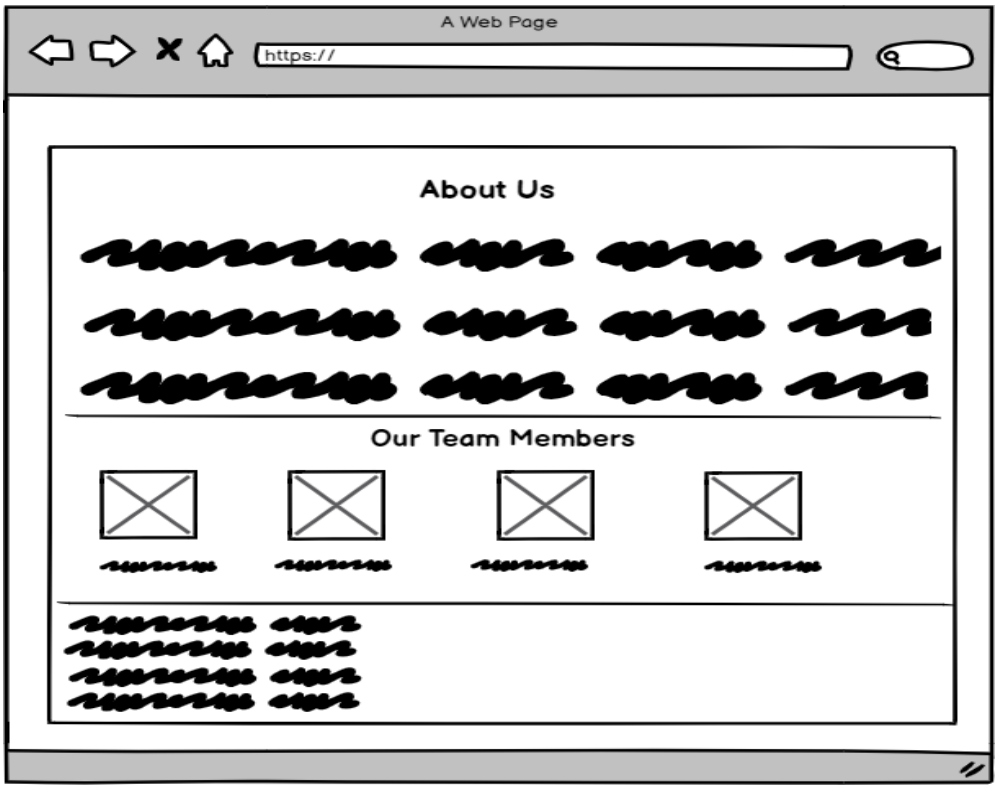


Figure 5: Wireframe 5: About Us

vi. Cart:

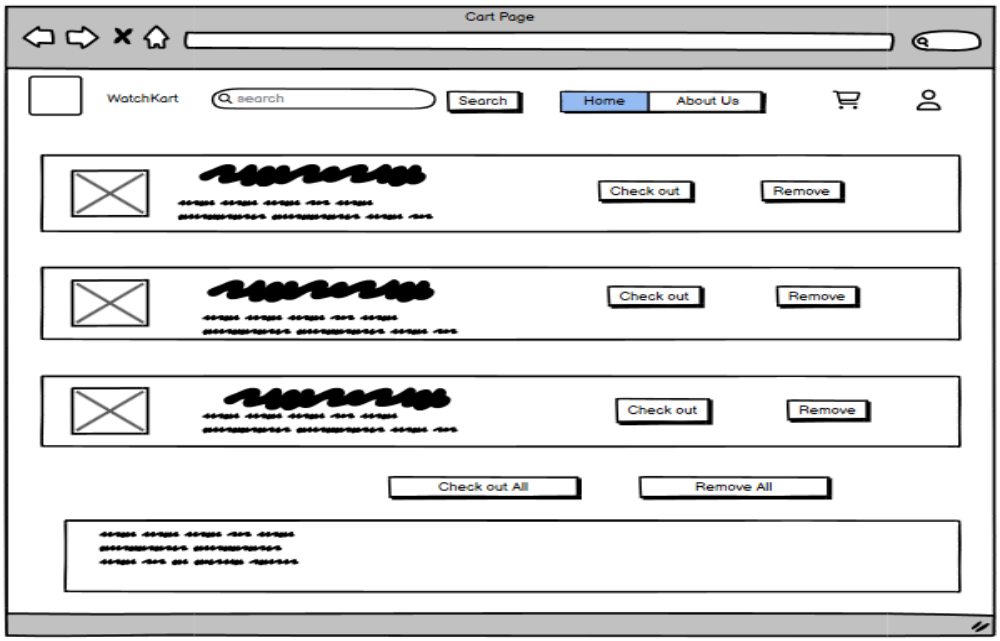


Figure 6: Wireframe 6: Cart

vii. Admin Panel:

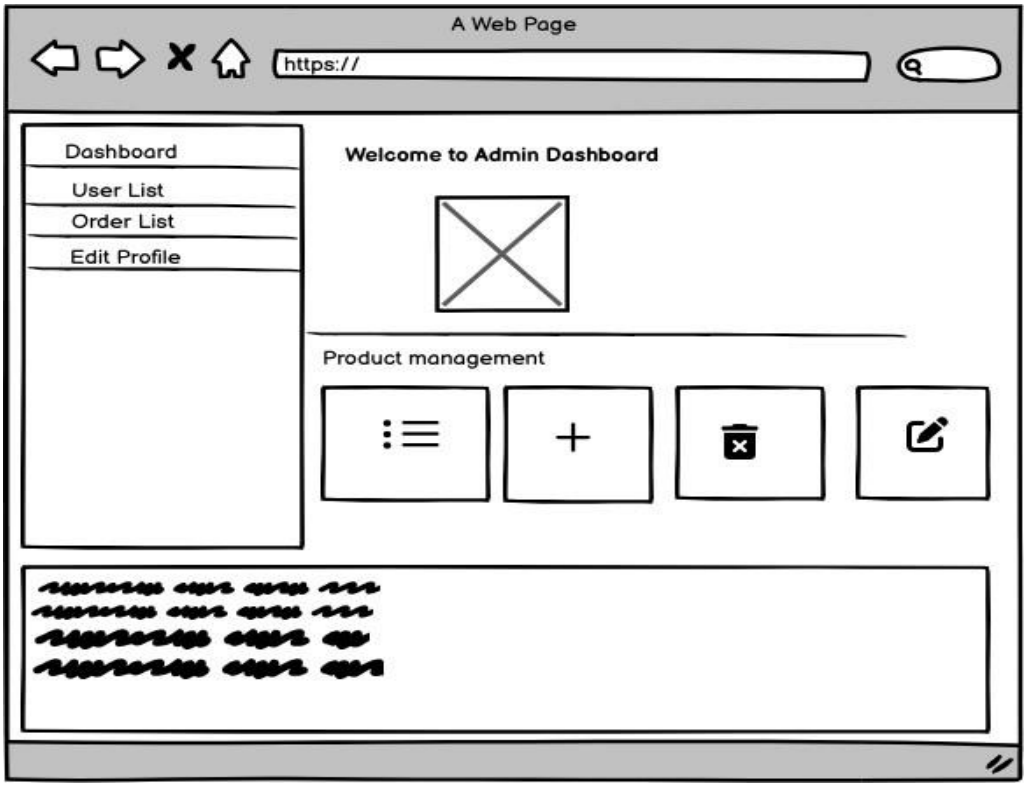


Figure 7: Wireframe 7: Admin Panel

viii. Add new Product:

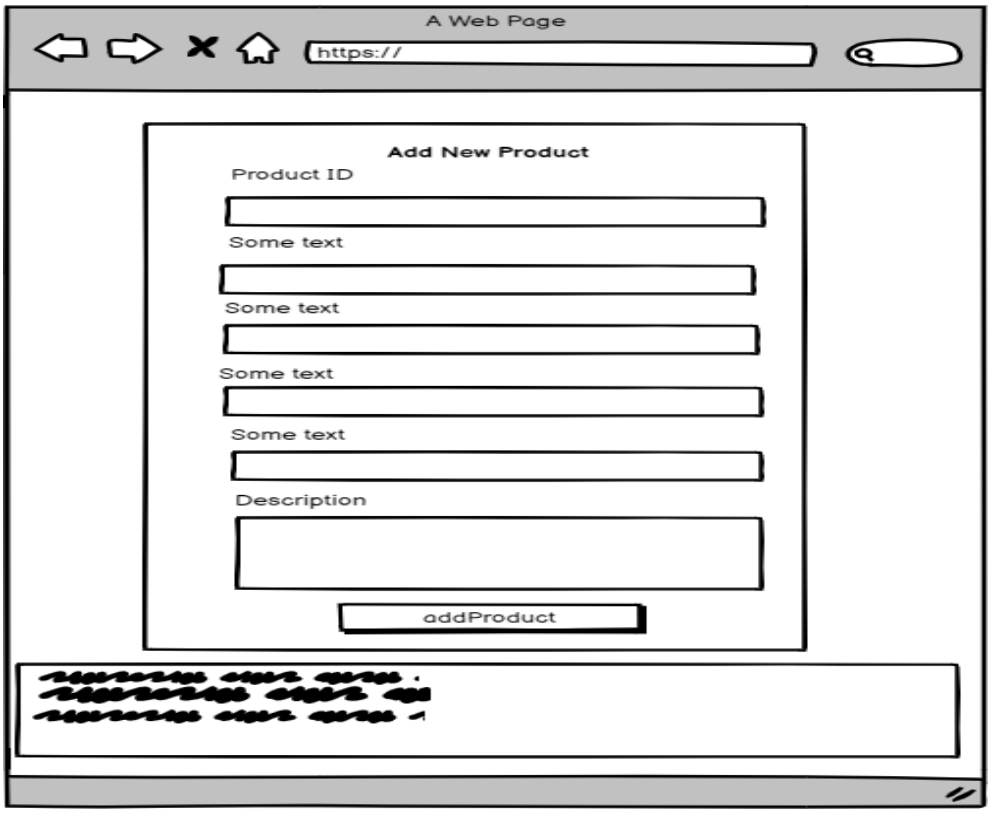


Figure 8: Wireframe 8: Add product.

2.2. Actual Design:

I. Signup page:

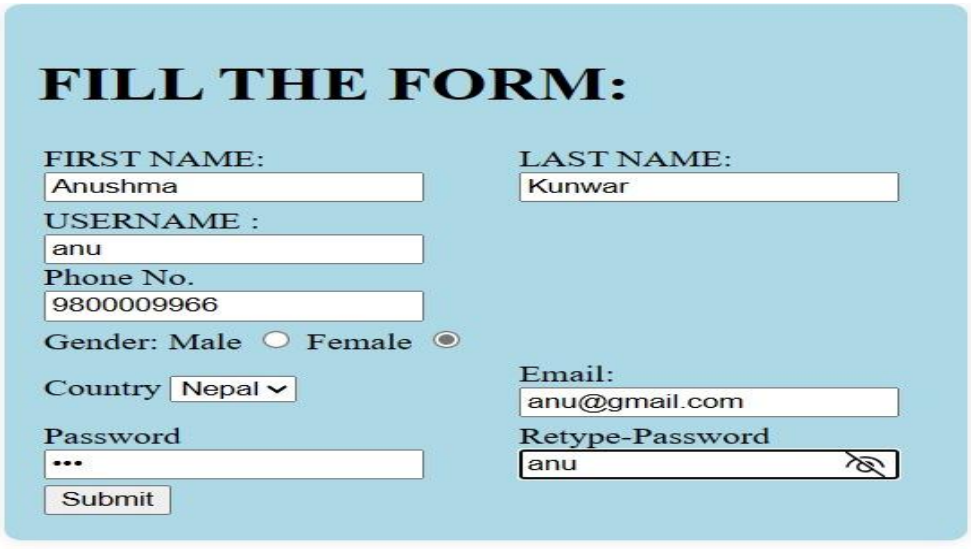


Figure 9: Signup

II. Login Page:

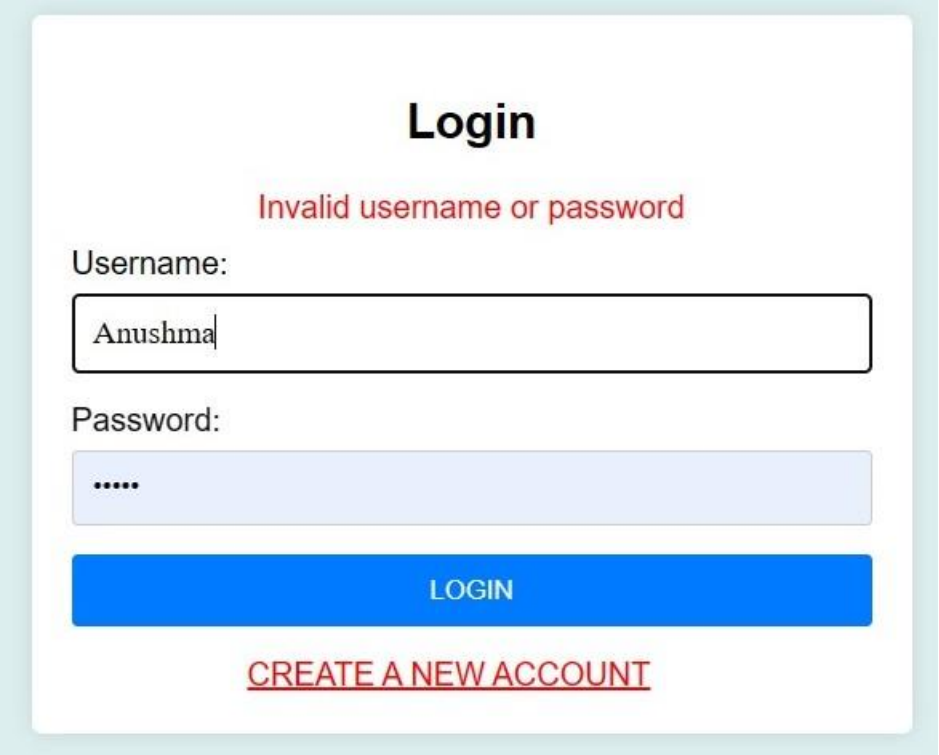


Figure 10: Login

III. Home page:

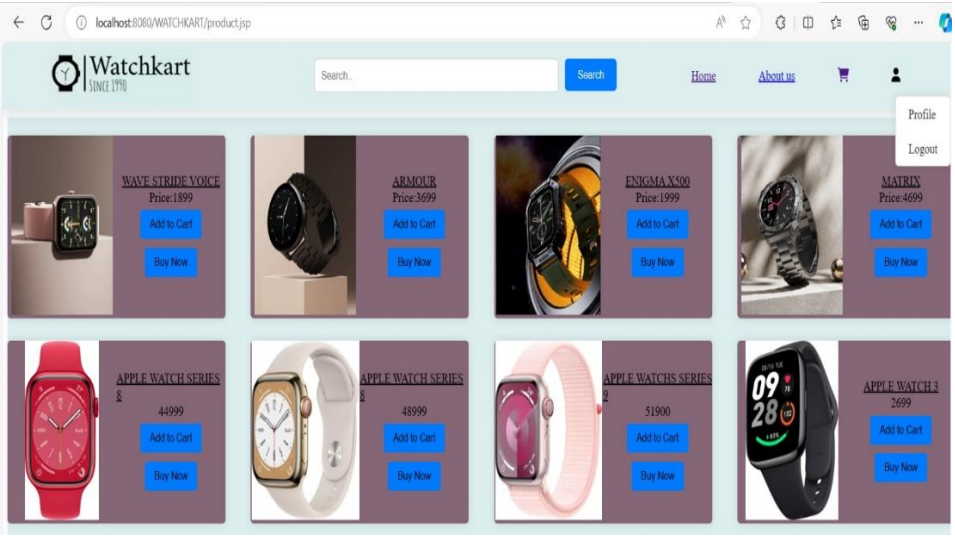


Figure 11: Home

IV. User Profile Page:

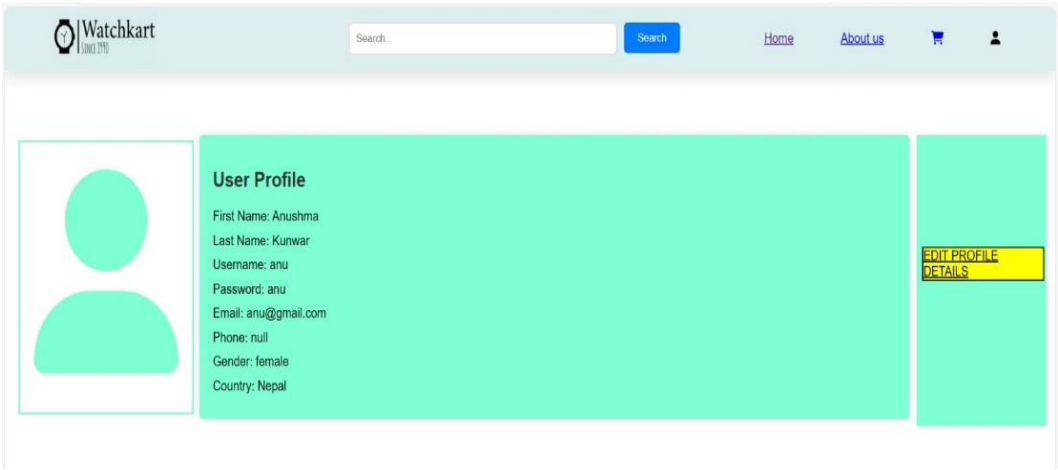


Figure 12: User profile

V. About Us page:

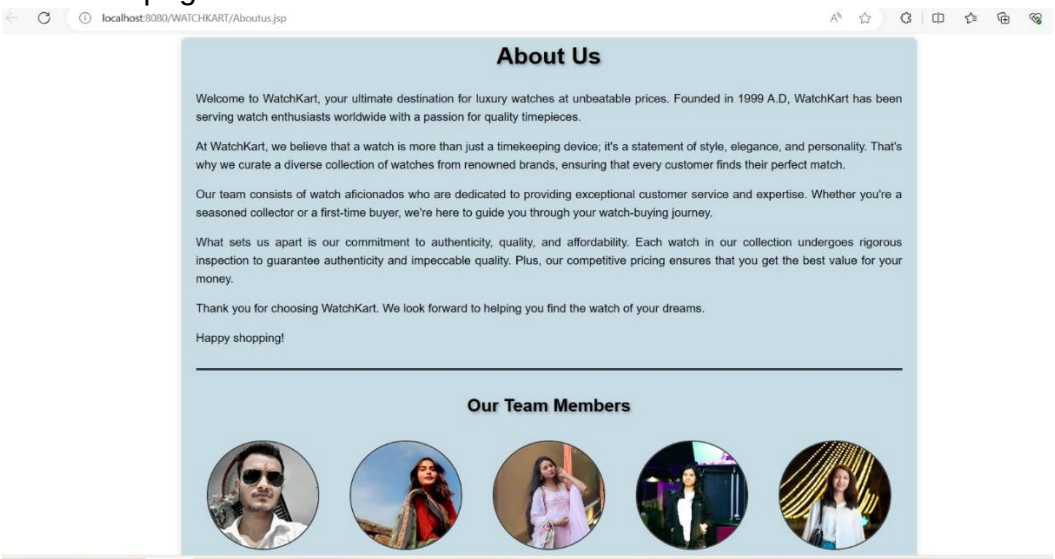


Figure 13: About US

VI. Cart Page:

Figure 14: Cart

VII. Order Bill page:

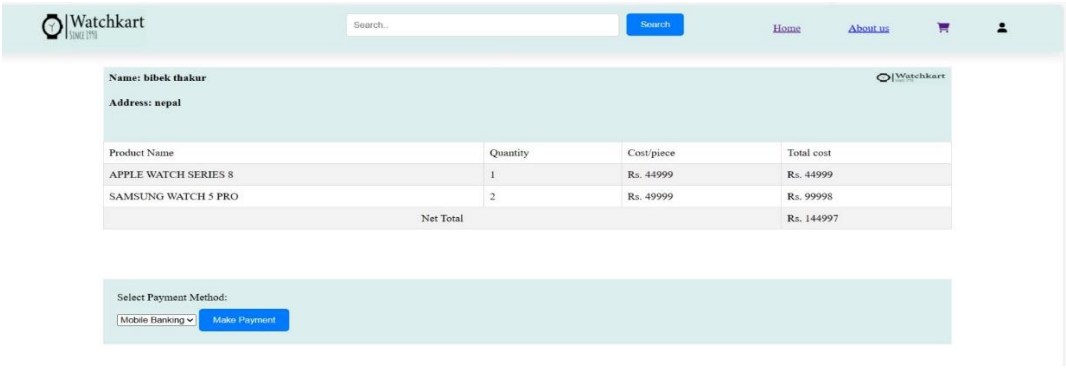


Figure 15: Order Bills

VIII. Admin Panel page:

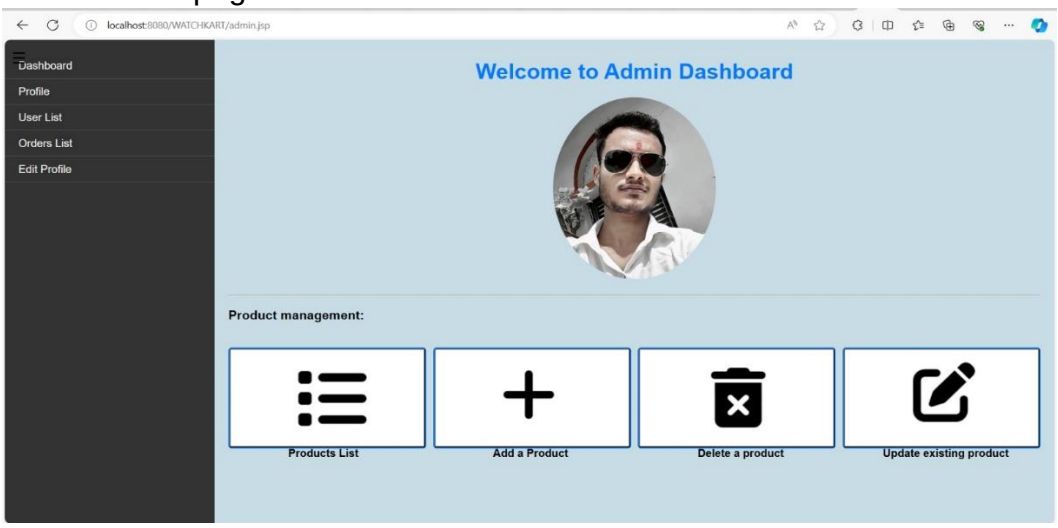


Figure 16: Admin Panel

IX. Add New Product page:

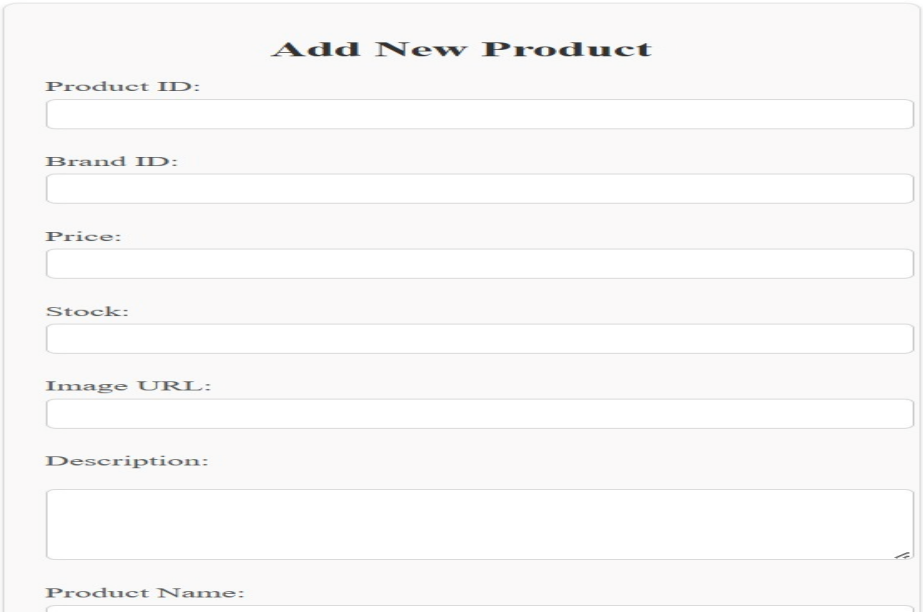
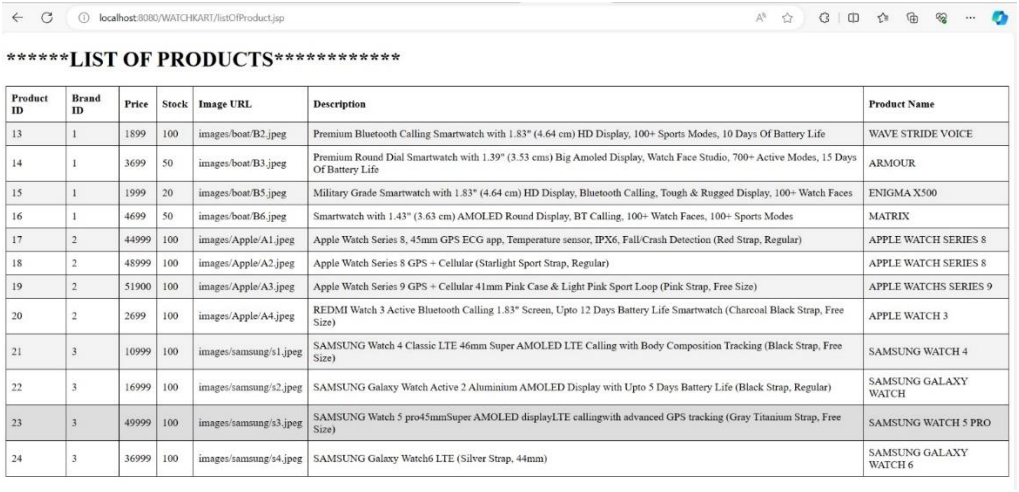


Figure 17: Add product

X. List of Product:

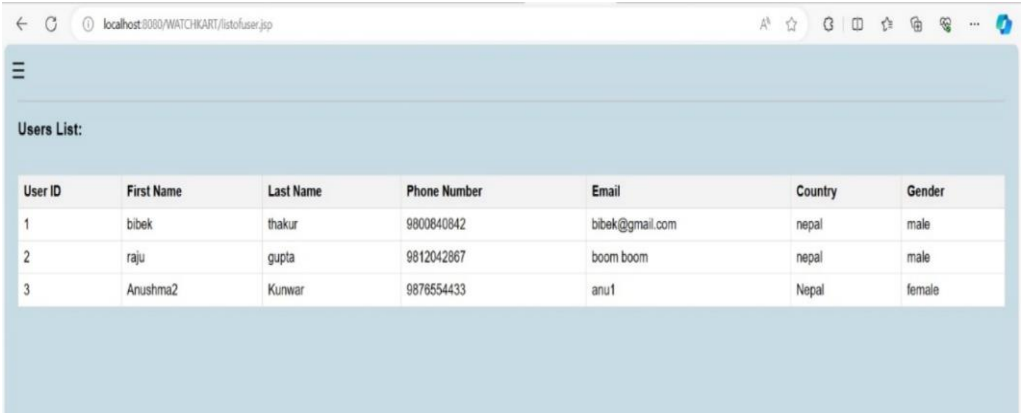


******LIST OF PRODUCTS**********

Product ID	Brand ID	Price	Stock	Image URL	Description	Product Name
13	1	1899	100	images/boat/B2.jpeg	Premium Bluetooth Calling Smartwatch with 1.83" (4.64 cm) HD Display, 100+ Sports Modes, 10 Days Of Battery Life	WAVE STRIDE VOICE
14	1	3699	50	images/boat/B3.jpeg	Premium Round Dial Smartwatch with 1.39" (3.53 cms) Big Amoled Display, Watch Face Studio, 700+ Active Modes, 15 Days Of Battery Life	ARMOUR
15	1	1999	20	images/boat/B5.jpeg	Military Grade Smartwatch with 1.83" (4.64 cm) HD Display, Bluetooth Calling, Tough & Rugged Display, 100+ Watch Faces	ENIGMA X500
16	1	4699	50	images/boat/B6.jpeg	Smartwatch with 1.43" (3.63 cm) AMOLED Round Display, BT Calling, 100+ Watch Faces, 100+ Sports Modes	MATRIX
17	2	44999	100	images/Apple/A1.jpeg	Apple Watch Series 8, 45mm GPS ECG app, Temperature sensor, IPX6, Fall/Crash Detection (Red Strap, Regular)	APPLE WATCH SERIES 8
18	2	48999	100	images/Apple/A2.jpeg	Apple Watch Series 8 GPS + Cellular (Starlight Sport Strap, Regular)	APPLE WATCH SERIES 8
19	2	51900	100	images/Apple/A3.jpeg	Apple Watch Series 9 GPS + Cellular 41mm Pink Case & Light Pink Sport Loop (Pink Strap, Free Size)	APPLE WATCHS SERIES 9
20	2	2699	100	images/Apple/A4.jpeg	REDMI Watch 3 Active Bluetooth Calling 1.83" Screen, Upto 12 Days Battery Life Smartwatch (Charcoal Black Strap, Free Size)	APPLE WATCH 3
21	3	10999	100	images/samsung/s1.jpeg	SAMSUNG Watch 4 Classic LTE 46mm Super AMOLED LTE Calling with Body Composition Tracking (Black Strap, Free Size)	SAMSUNG WATCH 4
22	3	16999	100	images/samsung/s2.jpeg	SAMSUNG Galaxy Watch Active 2 Aluminium AMOLED Display with Upto 5 Days Battery Life (Black Strap, Regular)	SAMSUNG GALAXY WATCH
23	3	49999	100	images/samsung/s3.jpeg	SAMSUNG Watch 5 pro45mmSuper AMOLED displayLTE callingwith advanced GPS tracking (Gray Titanium Strap, Free Size)	SAMSUNG WATCH 5 PRO
24	3	36999	100	images/samsung/s4.jpeg	SAMSUNG Galaxy Watch6 LTE (Silver Strap, 44mm)	SAMSUNG GALAXY WATCH 6

Figure 18: List of products

XI. User lists page:

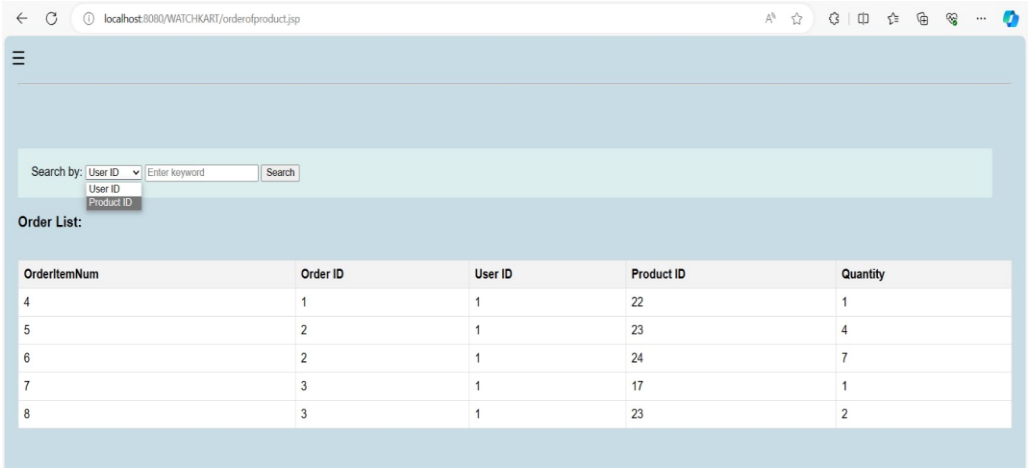


Users List:

User ID	First Name	Last Name	Phone Number	Email	Country	Gender
1	bibek	thakur	9800840842	bibek@gmail.com	nepal	male
2	raju	gupta	9812042867	boom boom	nepal	male
3	Anushma2	Kunwar	9876554433	anu1	Nepal	female

Figure 19: User Lists

XII. Order lists page:



Search by: User ID | Enter keyword | Search

Order List:

OrderItemNum	Order ID	User ID	Product ID	Quantity
4	1	1	22	1
5	2	1	23	4
6	2	1	24	7
7	3	1	17	1
8	3	1	23	2

Figure 20: Order lists

XIII. Edit Admin Profile Page:

Figure 21: Edit Admin Profile

3. Class Diagram:

3.1. Overall, Class Diagram:

3.2. Individual Class Diagram:

4. Method description:

The java files along with used methods are as follows: -

4.1. admindatabase.java:

- addProduct()
- deleteProduct()
- updateProduct()

4.2. adminprofiledatabase.java:

- getadmindatabase()

4.3. maindatabaseconnection.java:

- add() ->used to add users
- updateprofiledetail() -> used to update user profile
- addtocart() -> used to add items in cart
- removefromcart() -> used to remove items from cart using (single product)
- Removefromcartusinguserid() -> used to remove items from cart (multiple products)
- addtoorderid() -> adding items to order
- addtoorderitem()

4.4. Orderdatabase.java:

- getorderdetails()

4.5. productdatabase_connection.java:

- getproductdata()

4.6. profiledatabase.java:

- getuserdeatil()

4.7. usercartdatabase.java:

- getcartdetails()

5. Test Cases:

5.1 Test 1: Signup and Login testing

- Trying to login with a user that does not present in database.

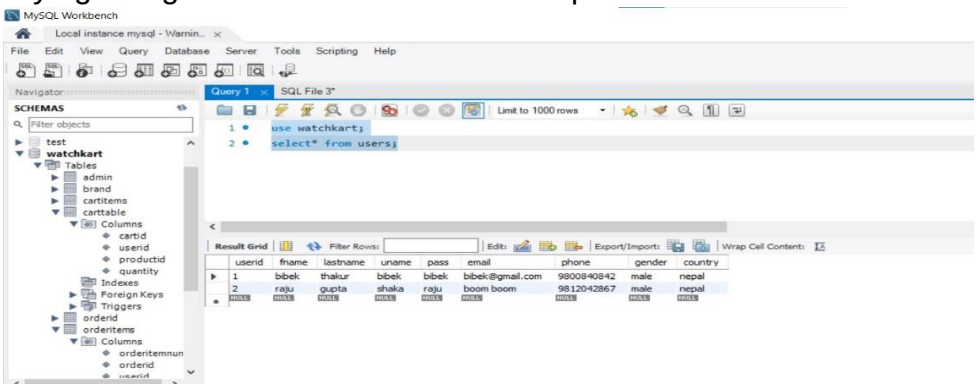


Figure 22: Test 1.1

- Invalid message

Figure 23: Test 1.2

- Adding user to database.

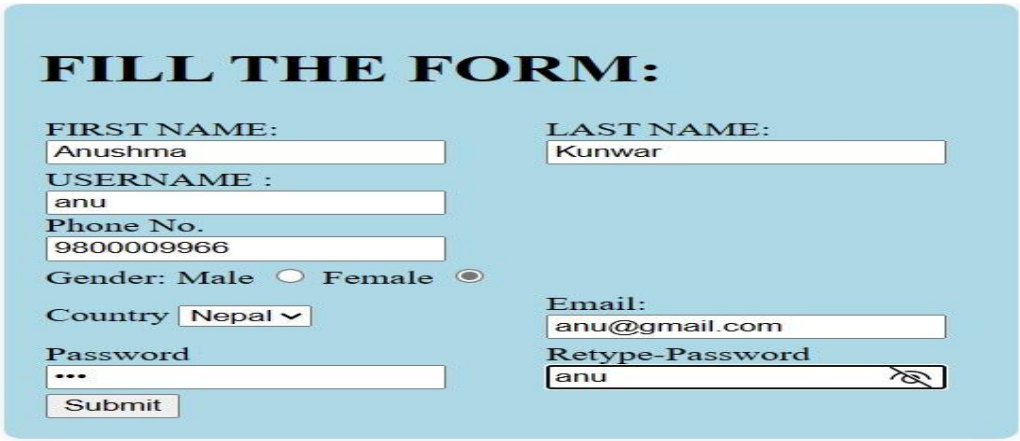


Figure 24: Test 1.3

- User added to database.

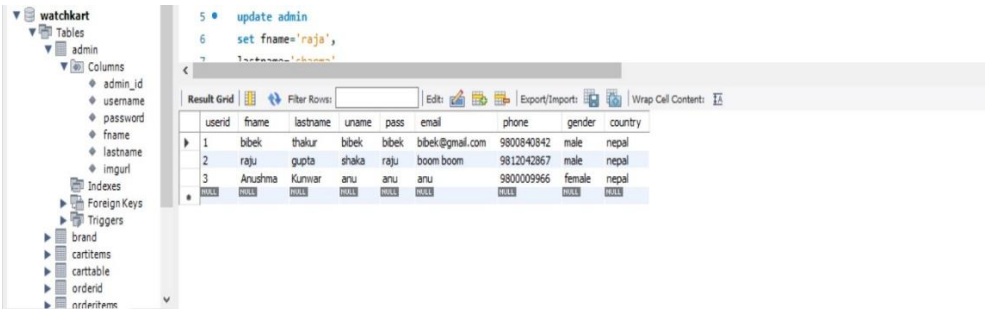


Figure 25: Test 1.5

- Now valid login directs to Homepage.

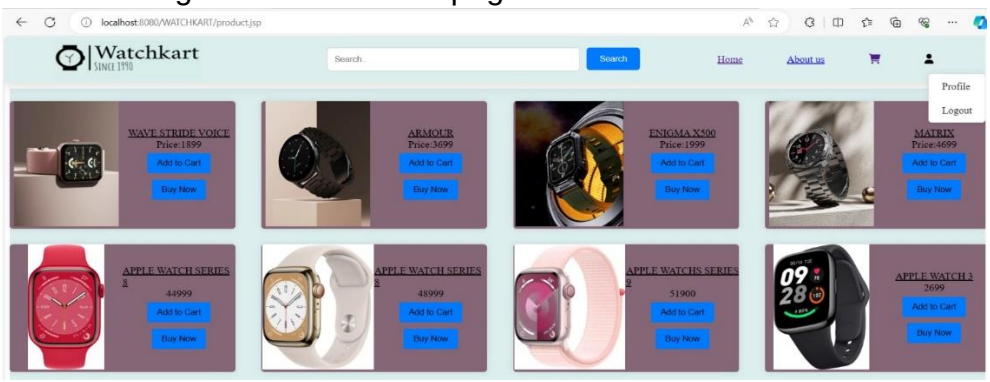


Figure 26: Test 1.5

5.2 Test 2: User Profile test.

- Now, View logged-in user.

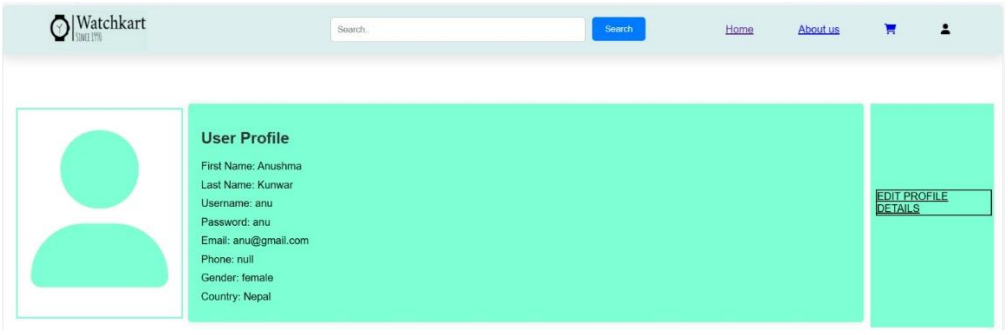


Figure 27: Test 2.1

- Click on Edit profile details.

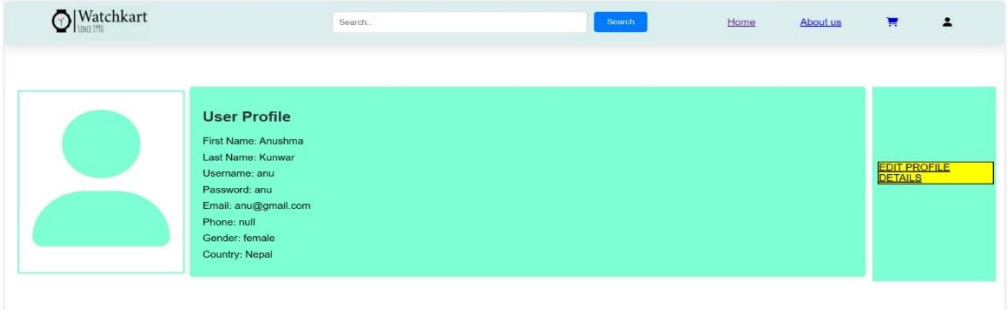


Figure 28: Test 2.2

- Filled Form for editing profile.

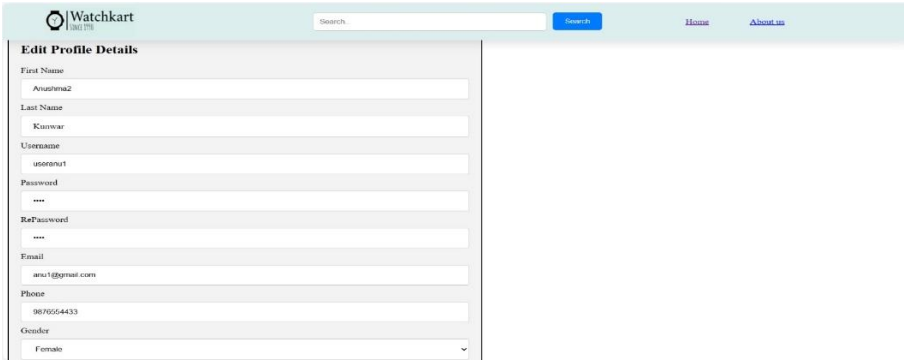


Figure 29: Test 2.3

- Updated user information inside database.

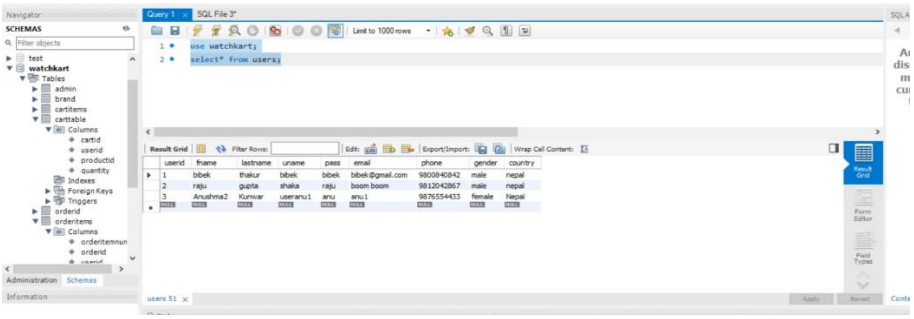


Figure 30: Test 2.4

5.3 Test 3: Cart Testing and Order billing testing

- No items in Cart.

Figure 31: Test 3.1

- Adding items in Cart.

Figure 32: Test 3.2

- Checkout for bills

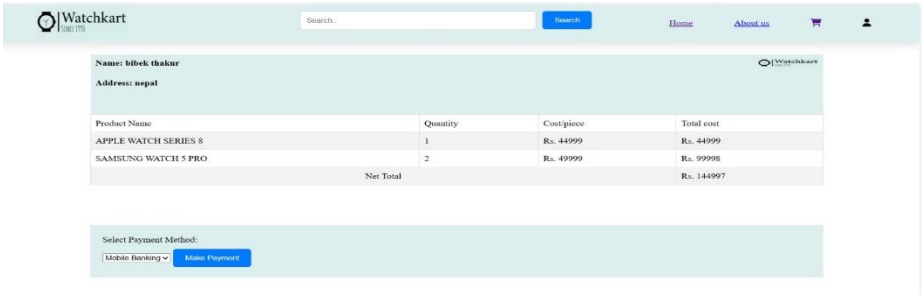


Figure 33: Test 3.3

- After payment or removal, cart item cleared.

Figure 34: Test 3.4

5.4 Test 4: Admin Panel (Side panel):

- Admin Login

Figure 35: Test 4.1

- View admin panel

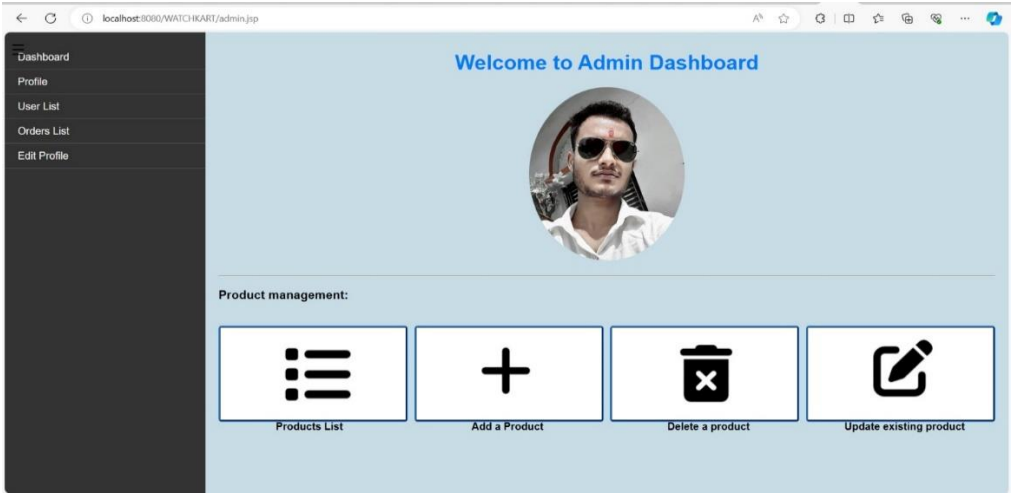


Figure 36: Test 4.2

- Viewing User list

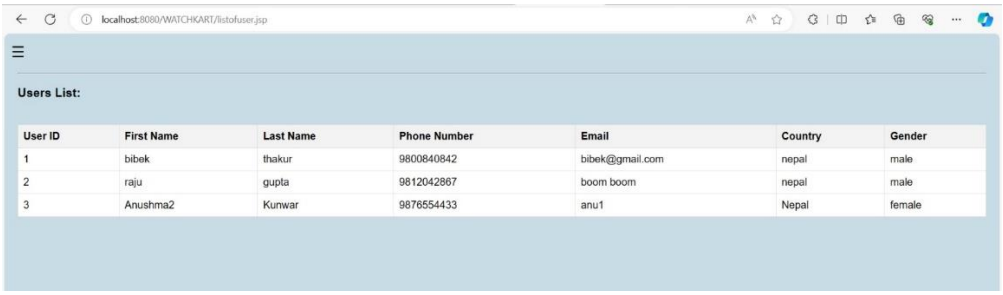


Figure 37: Test 4.3

- Orders List

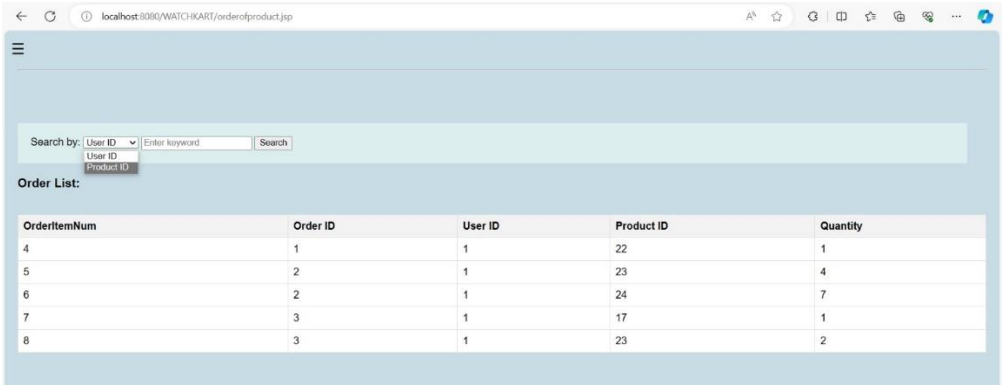


Figure 38: Test 4.4

5.5 Test 5: Admin Panel (Dashboard):

- List Products

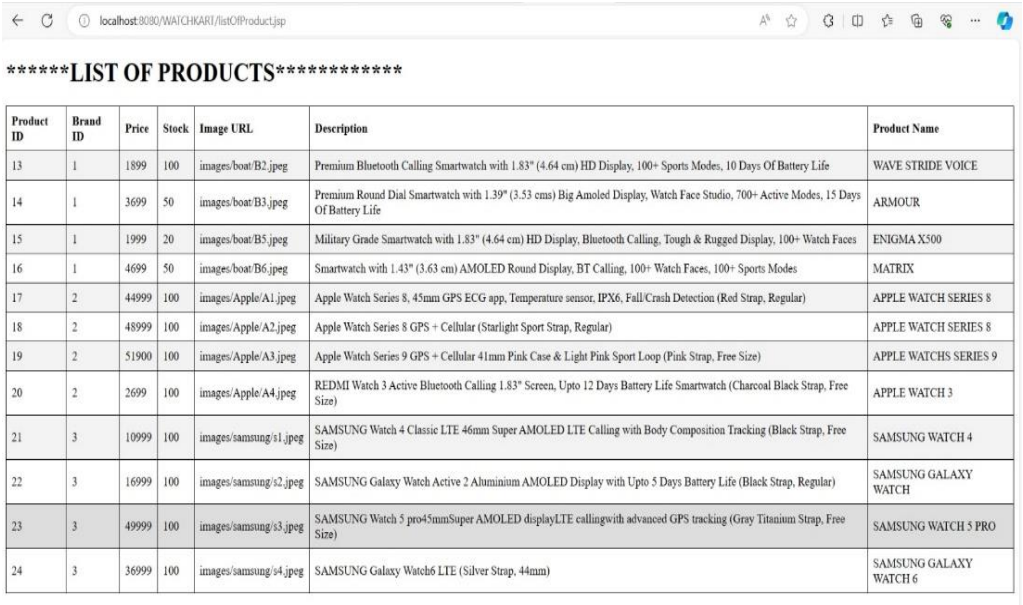


Figure 39: Test 5.1

- Add New product.

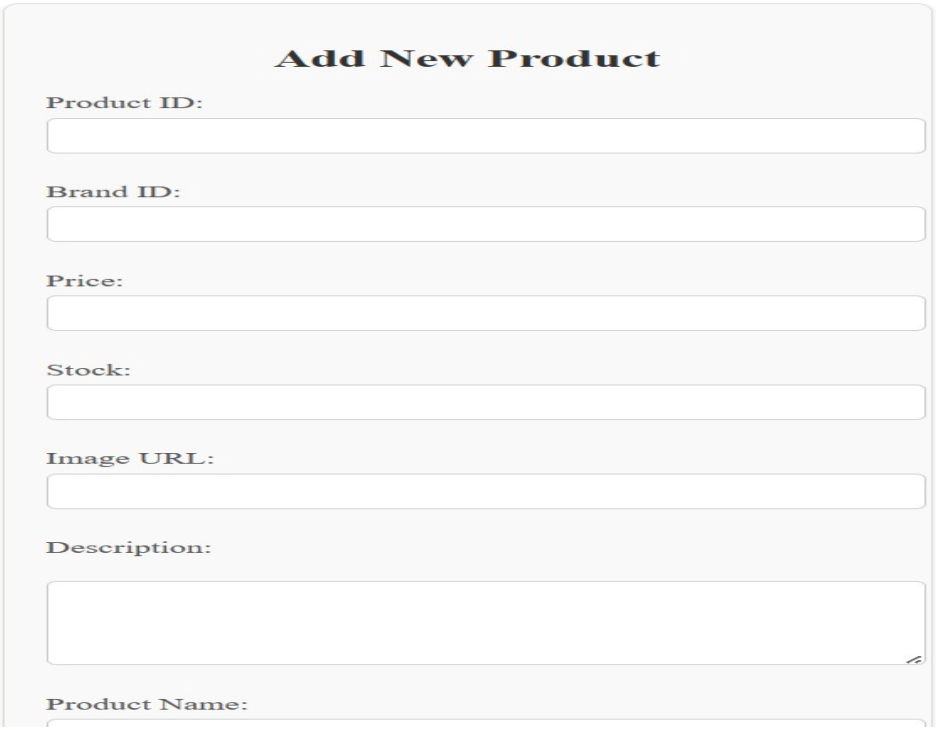


Figure 40: Test 5.2

6. Tools and libraries used:

6.1 Programming Languages:

- Java Programming: For server-side development and implementing servlets for the controller.
- HTML/CSS and JavaScript: For creating the website's structure and client-side interactions and dynamic content.

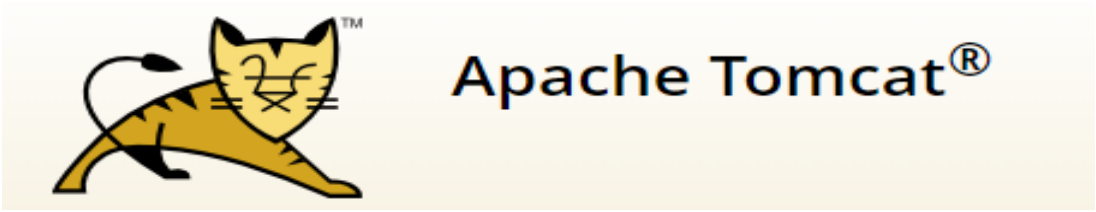
6.2 Tools Used in Development:

I. Eclipse IDE:

Eclipse IDE is a world-wide recognized and widely used open-source Java IDE primarily designed for java development, although it supports others programming languages like C, C++, JavaScript, PHP, etc. through plug-ins. It is a flexible, extensible and robust tool with plenty of features and capabilities in-built. It has Java Development Tools (JDT) that works with Java EE (Enterprise Edition) technologies like servlets, JSP, EJB, JPA, etc. These libraries enhance Eclipse's capabilities for programming, tools, tasks, frameworks, etc (Geeksforgeeks, 2023).

II. Tomcat:

Apache Tomcat is an open-source web server and Servlet container for Java code. It is a Java development tool that is suitable for production use and is used to implement multiple Jakarta EE (formerly known as Java EE) specifications. The most recent version of Tomcat, Apache Tomcat 10.1.18, is still being actively developed (Fol, 2024).



III. Xampp:

Xampp is a collection of software containing a webserver named Apache (Tomcat) and a web-based tool written in PHP for managing MySQL databases (phpMyAdmin).

Including phpMyAdmin in XAMPP with Tomcat allows developers to conveniently manage MySQL databases through a user-friendly web interface (javatpoint, 2024).

IV. Balsamiq:

A tool for user interface design that may be used to create wireframes is Balsamiq Wireframes (also termed mockups or low-fidelity prototypes).

It is used for generating the digital sketches of an idea or concept for an application or website, etc (Balsamiq, 2024).

V. **MySQL Workbench:**

Due to some issues while connecting XAMPP for MySQL, i.e. phpMyAdmin was not working properly, thus with the permission of tutor, MySQL workbench was used alongside tomcat for the project instead of phpMyAdmin of Xampp.

A unified visual database designing or graphical user interface tool for database architects, developers, and database administrators is MySQL Workbench (Javatpoint, 2024).

6.3 Libraries Used:

1. **Servlet API and JSP (Java Server Pages):**

Java servlets are the java programs that run on the web server or application server which are enabled with java. They are used to receive requests from the webserver, manage them, process them, generate responses, and then reply to the webserver with those responses.

The Servlet API has all the required interfaces and classes that are essential to develop java servlets. Servlet API comes with two packages:

- Javax.Servlet
- Javax.servlet.http (Geeksforgeeks, 2024).

Similar to Servlet technology, JSP technology is used to construct web applications. Because it offers additional capabilities than Servlet, like expression language and JSTL, it can be viewed as an extension of Servlet.

A JSP page consists of HTML tags and JSP tags (Javatpoint, 2024).

2. **JSTL (JavaServer Pages Standard Tag Library):**

   A collection of tags called the JavaServer Pages Tag Library (JSTL) can be used to handle several frequently occurring tasks, including conditional formatting and looping (Baeldung, 2024).

3. **Apache HttpClient:**

   HTTP queries to a website can be made using Apache HttpClient, which allows users to obtain the HTML content and parse it to extract pertinent data. Web services and APIs are examples of HTTP-based services that can be tested using Apache HttpClient (Knoldus, 2024).

4. **JDBC Drivers:**

   JDBC (Java Database Connectivity) is used in dynamic web projects to connect Java applications to databases, allowing them to retrieve, manipulate, and update data stored in the database. JDBC drivers are Java library files with the extension '**.jar**' (DbSchema, 2024).

7. Development Process:

The development process of this project consists of following phases: -

7.1. Software Installation:

7.2. Wireframes design:

7.3. Database Normalization and Database tables:

Up to 3NF, the data was normalized to get final tables for database design.

- Evidence

UNF (Un normalized form):

Users(UserID(Pk),UserName,Password,Role,Email,Phone{ProductID,Name,Description,Price,Stock,Image{OrderID,OrderDate,Status,TotalAmount,Quantity}}).

Normalization: A way of removing the data duplications and data anomalies from the tables is called normalization. It helps in data conversion into small and simple format for the relationship among entities without or with minimal data anomalies. It decreases the data redundancy and gets rid of undesired anomalies that may occur in the database system. It helps in removal of data anomalies like insertion, Update, and Deletion anomalies.

1NF: The First Normal Form is a basic form for the relational database design, it ensures to maintain the data integrity and data organization. In the 1NF, each of the column in a table must contain atomic data which prevents the multiple values in a single column. There cannot be repeating groups for the UNF to be of First Normal Form.

For 1NF,

- There should be the proper defining of primary keys and non- primary keys.
- The repeating groups and repeating data are separated.
- The repeating groups are separated in their own connections.

Users-1 (UserID(Pk),UserName,Password,Role,Email,Phone)

Product-1 (ProductID(PK),Name,Description,Price,Stock,Image)

Order-1 (OrderID(PK),OrderDate,Status,TotalAmount,Quantity)

2NF (Second Normal Form): 2NF is a normalization concept, which is built on the principle of 1 NF. In 2NF, the focus is on tables with composite primary keys. It mandates that all non-primary key attributes

Figure 41: Normalization (1)

3NF (Third Normal Form): In 3NF, a table should be in Second Normal Form (2NF), and it introduces the additional requirement that no transitive dependencies exist. The transitive dependencies are removed for the data to be in 3NF.

The tables in 2NF are already non-transitive dependent. All tables remain the same as they are already in 3NF.

So, the final tables are as follows:

Users Table (3NF):

- UserID (Primary Key)

- UserName
- Password
- Role
- Email
- Phone

Products Table (3NF):

Figure 42:Normalization (2)

7.4. Database design in MySQL:

From Normalized tables, the database was created with major tables inside MySqL work bench.

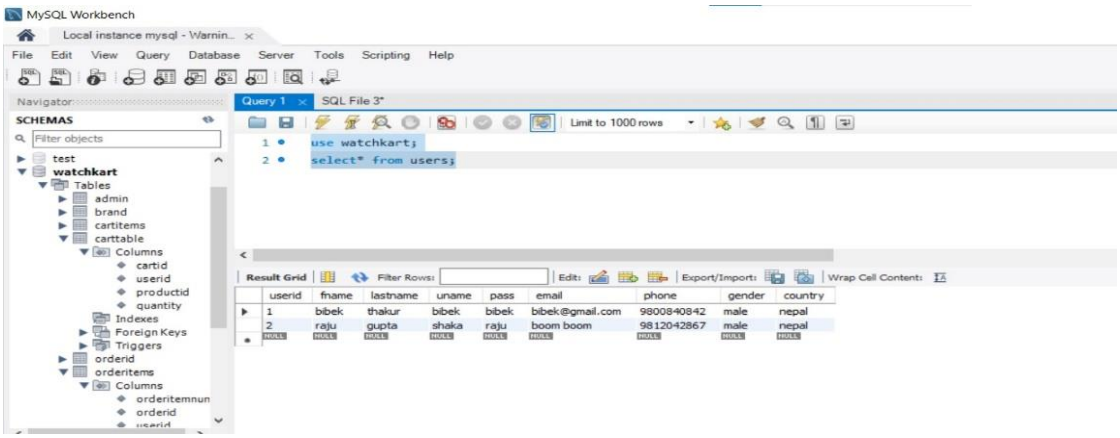


Figure 43:Database design.

7.5. Coding in Eclipse and installing all essential libraries/tags.

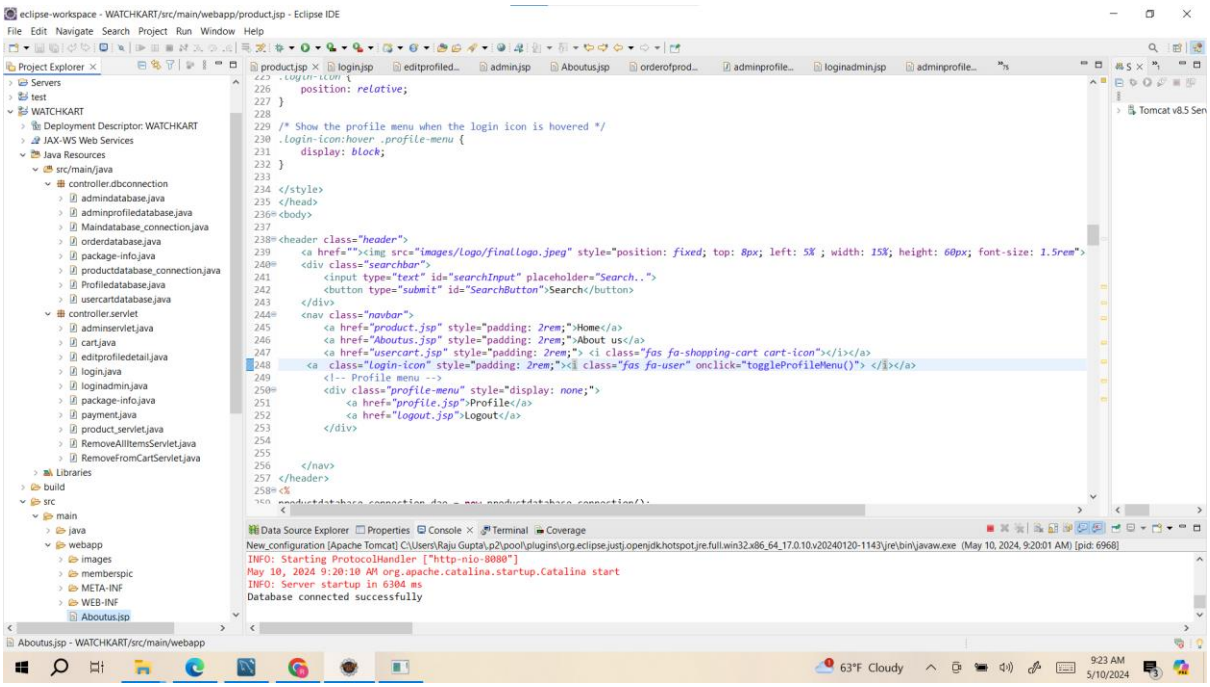


Figure 44: eclipse Project.

7.6. Testing the proper working of the eclipse files:

After coding those files, unit testing of each JSP and Servlet files were done.

- Evidence

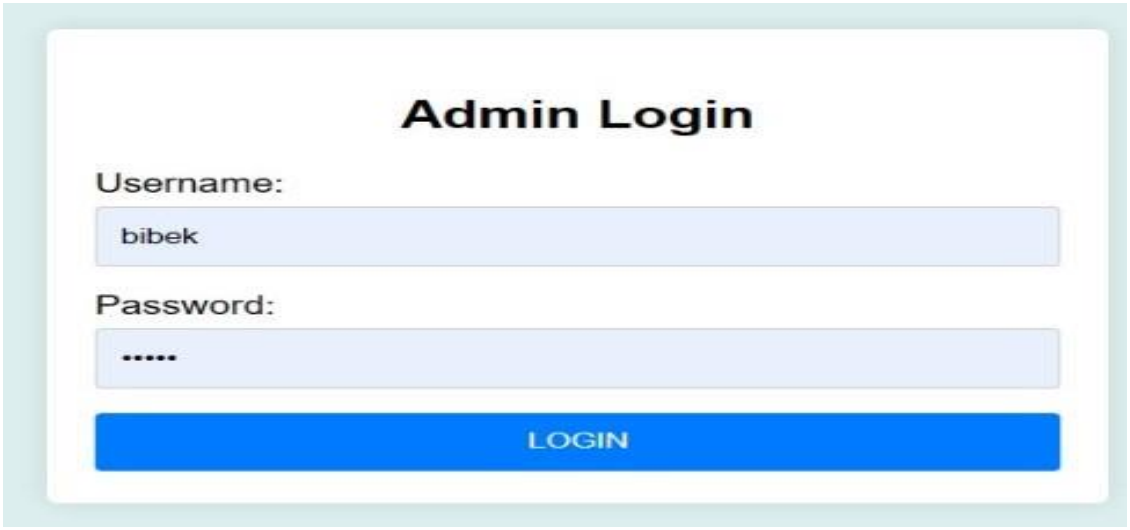


Figure 45: Admin login.

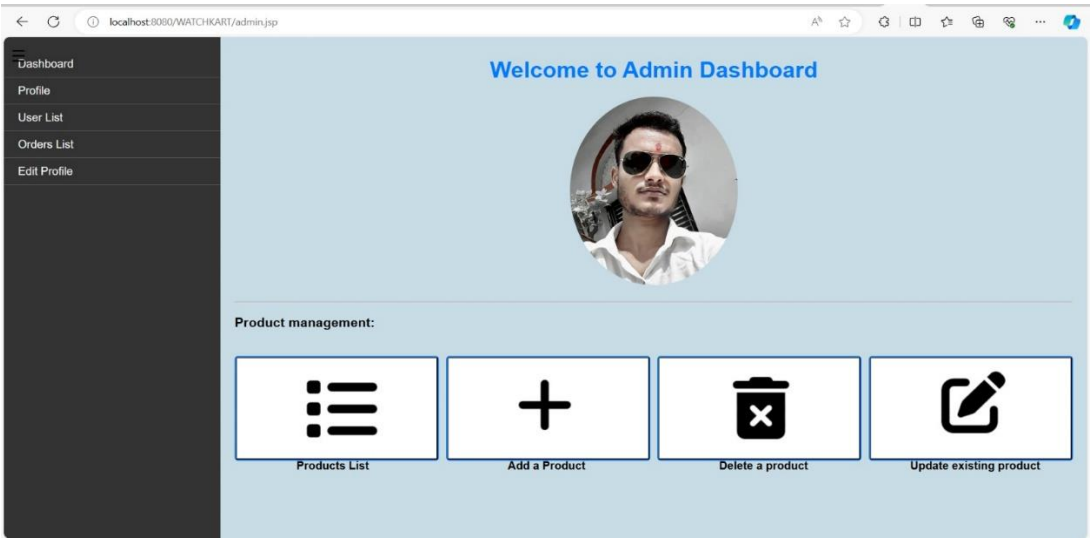


Figure 46: Admin panel redirection from login.

7.7. Using JDBC driver to sync eclipse files with database:

The proper sync of eclipse files (JSP, Servlets and Others) with database using MySQL jdbc connector was done and tested multiple times.

- Evidence

  (Test 1:)

7.8. Necessary arrangements and rectifying errors of final project file:

Final arrangements and rectification of files of project was done.

- Evidence

  Website running properly:

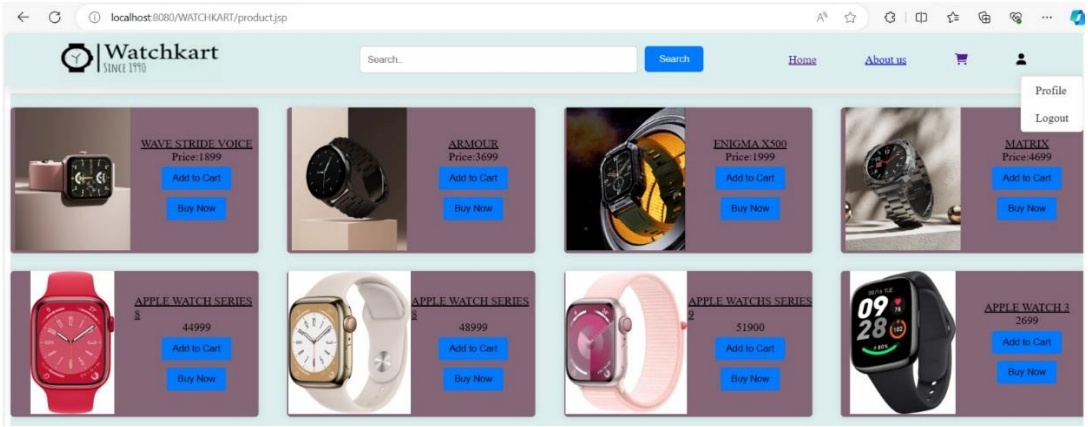


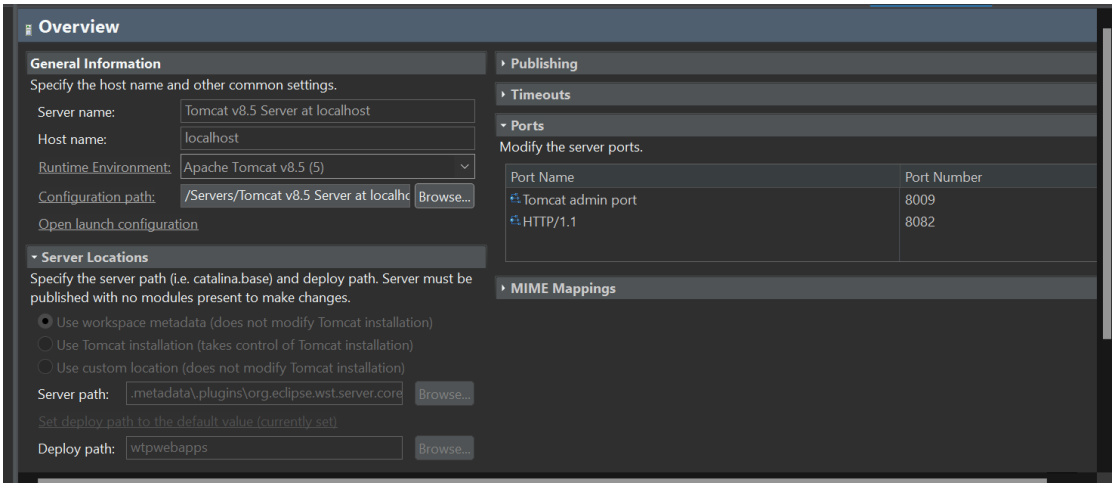
Figure 47: Home page of website.

8. Critical Analysis:

The Challenges and Problems Faced during the coursework development are: -

8.1. Server Problems

- Issues: Port Issues, Synchronizing problems, etc.
- Fix: Fixed by using alternative port number for tomcat and http server.



8.2. Coding errors:

- Issues: Multiple core errors like syntax errors, logical errors, mapping errors, redirections errors, and many others occurred in JSP, servlet and other files.
- Fixes: Tutor and Lecturer reviews and rectification, online materials like websites, YouTube tutorials etc to rectify those errors and problems.

8.3. Project file management problems:

- Problem: Initially, a test project was created where the files were presented in a random way without MVC.
- Fixes: Files managed properly.

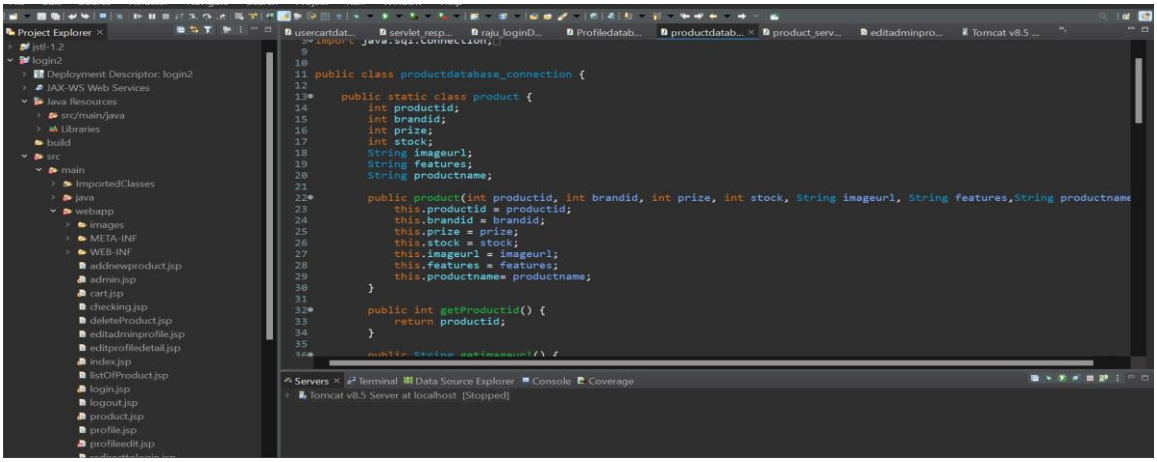


Figure 48: Before

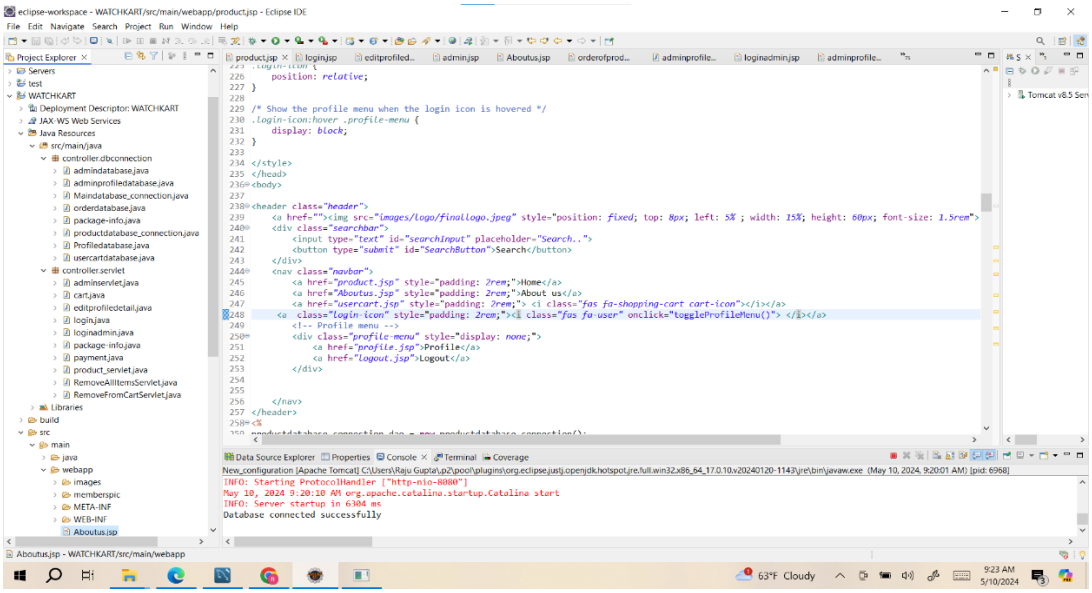


Figure 49: After

9. Conclusion:

In conclusion, we as a group have come across a long and challenging journey of developing an e-commerce website for smartwatches. With all the challenges we faced at the end its rewarding. Following the Model-View-Controller (MVC) design pattern as instructed, we are able to establish a robust and scalable platform that can meet the need of the customers. While doing the assignment, our main focus was to create seamless and simple user experience.

As we also mentioned to showcase latest smartwatch technology which is reflected in the varieties of products that is presented to our users. As we are the beginners of the coding world, we are not perfect in making the website, but we can promise that we gave our full involvement and completeness.

At last, we would like to express our gratitude to our tutor for helping in every step of our journey through their feedback, support, and expertise.

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