

**NANYANG TECHNOLOGICAL UNIVERSITY**

**SEMESTER 2 EXAMINATION 2017-2018**

**CI6206 – INTERNET PROGRAMMING**

April/May 2018

Time Allowed: **3 hours**

**INSTRUCTIONS**

1. This paper contains **FOUR (4)** questions and comprises **NINE (9)** pages. Appendices of **SIX (6)** pages are distributed separately.
  2. Part One: Answer the **ONE (1) COMPULSORY** question. (40 marks)
  3. Part Two: Answer **TWO (2)** of the **THREE (3)** questions. (60 marks)
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**PART ONE: Answer the ONE (1) COMPULSORY question.**

1. **Rentabike** is a leading local-based company that provides bike rental and sharing services by integrating today's IoT (Internet of Things) technology. Bikes operated by Rentabike is publicly available anywhere. Cyclists who wish to start a ride are required to register for an account before they are allowed to unlock the bike. To unlock the bike, cyclists are required to scan the QR (Quick Response) code found on the bike. Rentabike provides the following application to their users :
  - (i) For Cyclist: To provide a mobile application front-end for unlocking bike belonging to Rentabike and a web site to allow registered users to perform some services.
  - (ii) For Administrator: To provide a website that allows administrator to perform administrative functions.

**The following web site ([Rentabike.com](http://Rentabike.com)) features are provided for the users (cyclists):**

- *Sign-up page.* Online customers must first register an account in the website. The following are information that users must enter.
  - (i) Registration Information
    - ‘Email Address’ as user id

**Question 1 continues on Page 2**

- ‘Account holder Name’
  - ‘Mobile No’ – to provide SMS verification of mobile no.
  - ‘Password’ and ‘Confirm Password’
  - Credit card Info.
  - Date of birth - minimum age for registration is 14-years - old.
  - Users are required to pay an initial upfront \$50 as deposit.
  - System will check if both passwords entered matches – ‘Password’ and ‘Confirm Password’ fields.
  - All fields are compulsory.
- *Ride history.* The web site should allow users to view a list of their rides history including the information as such the day and time/duration of the ride.
    - (i) There should be a filtering feature that allows users to view and filter their rides by year and/or month.
    - (ii) Clicking on any of the rides from the list should display a more detailed ride info such as the route taken, date and time including the charges incurred for the ride.
  - *Ride feedback and rating.* The web site should allow users to add and display the feedback input by the user after each ride. The following are the fields required by users who wish to provide feedback for their ride.
    - (i) Rate the condition of the bike (e.g brake, seat, wheels)
    - (ii) Rate the overall ride experience.
    - (iii) Comments if any.
  - *Reporting.* The web site should allow users to report any issues or incidents that warrant Rentabike to take up immediate action.
    - (i) Upload photos of the incident observed.
    - (ii) Provide comments of the incident.
    - (iii) Provide a GPS location of the incident.
    - (iv) Category of incident :
      - Bike is parked indiscriminately.
      - Bike is damaged.
      - Bike is discarded onto drains etc.
  - *Login Page*
    - (i) The page should allow registered users to login to the website.
    - (ii) Rentabike.com is secured with 2-factor authentication: “Login & password” and “SMS OTP”.
    - (iii) Sign-up for a new account if they do not have any existing account.
    - (iv) ‘Forget Password’ feature that reset and send new password to user via email – users are required to enter both email and mobile number.

**Question 1 continues on Page 3**

- (a) Design **TWO (2)** graphical user interfaces for the ‘Register’ and **TWO (2)** graphical user interfaces for the “Ride History” features, focusing on functionalities and user friendliness. State any assumptions clearly.
- (16 marks)
- (b) Design **TWO (2)** graphical user interfaces for the ‘Ride feedback and rating’ and **TWO (2)** graphical user interfaces for the “Reporting” features focusing on functionalities and user friendliness. State any assumptions clearly.
- (16 marks)
- (c) In addition to the 2-factor authentication technique used in the web site, describe **TWO (2)** additional features that could help to further enhance the overall security of the user authentication process. Your solution should address the issue of “failed login attempts”. Provide graphical user interfaces to illustrate your solution if required. State any assumptions clearly.
- (8 marks)

**PART TWO:** Answer **TWO (2)** of the **THREE (3)** questions.

2. (a) Describe the functions of Servlet Container and with the help of a diagram, explain the Life-Cycle of a Java Servlet inside the Container.
- (6 marks)
- (b) In any typical online web site, password should never be stored in the database as clear text, but as hash value. With the help of a diagram (e.g database table), explain how ‘Salted Password Hashing’ method helps to store users’ password during registration and later use for user authentication process as well.
- (10 marks)
- (c) There is a server-side program (servlet) that allows users to register an account with Rentabike.com (Refer to Question 1 for more information). The Servlet will verify if the email entered has been registered before. Assuming all user data is stored in a database. Write a Java Servlet and/or JSP that meets the following specifications:
- To register for an account, new users enter the necessary information (Refer to Question 1 for more information) on the registration page, **Register.jsp**. The parameters values are sent to a servlet **RegisterServlet**. The parameters can be retrieved using the **getParameter** method and **getParameterValues** method.

**Question 2 continues on Page 4**

- There is an existing method, **DBController.checkEmailExist(emailAddress)** that verifies if the user's email address exists in the database. It returns a boolean value:
  - True – if email address exists in the system.
    - Servlet will redirect user back to Register.jsp and display additional information on the webpage: "The email you have entered is not valid, please register using another email account"
  - False – if email address does not exist in the system.
    - Servlet will redirect user to VerifyOTP.jsp. If the OTP entered is correct, VerifyOTP.jsp will complete the registration process by creating a new user account, and update the database.
  - Database Controller Method to verify OTP challenge :
    - DBController.verifyOTP(String email, String OTP)
    - Return 'True' if OTP challenge is correct. Return 'False' if data entered is incorrect.
  - Database Controller Method to create user account:
    - DBController.registerUser (x parameters)
    - Return 'True' if database update is successful.
    - Return 'False' if database update is not successful.
    - x – propose the number of parameters required to fulfil the requirements in Question 1.
- Once the OTP is verified, VerifyOTP.jsp will display a message (where jason88@yahoo.com is the login) on the user's browser as shown below :

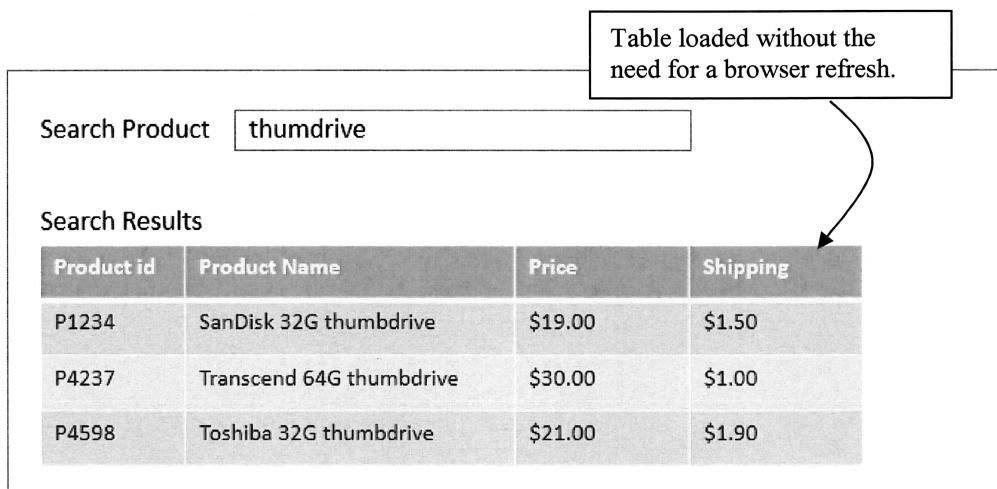
***Verify your Email Address***

*We've sent an email to [jason88@yahoo.com](mailto:jason88@yahoo.com) to verify your email address. Please click on the link in that email to continue.*  
*Thank You.*

- You do not need to write the entire Servlet. Only the doPost method is required. Additional methods and fields may be created if necessary.
- Perform session tracking whenever necessary.
- State any assumptions clearly.

(14 marks)

3. (a) Describe with the help of a diagram, the interaction between the various components (including html, jsp file and servlet) within a Model-View-Controller (MVC) pattern. Create skeletal codes to demonstrate how a typical web application can be implemented with reference to MVC pattern. (10 marks)
- (b) Explain with the help of a diagram how AJAX Architecture differ from traditional web application architecture. List **TWO (2)** advantages of AJAX over traditional web application. (6 marks)
- (c) Figure Q3c shows an online store “search product” page. A JSP page **SearchProducts.jsp** allows the online users to search and display a list of products according to the name of the product. After submitting an online product search request, an **AJAX request** is sent to a server-side program that returns a search results in **JSON or XML format**. If no results are being returned, a message “No products are found” is displayed instead of the table.



**Figure Q3c. Search Products (SearchProducts.jsp)**

Write an AJAX application that supports the functionality as described above that meets the following specifications:

- The content of the table shown in Figure Q3c is loaded without requiring the screen to perform any refresh.
- Assume that the server-side program exists and its absolute path is **/SearchProducts**
- User enters the search string.

**Question 3 continues on Page 6**

- The server-side application accepts one query string parameter named **searchString** as input field from **SearchProducts.jsp**.
- The server-side application will return data in XML or JSON format. Propose and design your own XML or JSON file and format.
- Provide sufficient comments in your code.
- A graphical user interface is shown in Figure Q3c.
- State any assumptions clearly.

You are to use the code listed in Appendix Q3. Comments are provided as a usage guide. Do not reproduce the code in your answers unless there are modifications. State any assumptions made.

(14 marks)

4. (a) Figure Q4a-1 shows a HTML page with three lines of texts. If the “Highlight” button is pressed, the text “Select this line.” will be painted as “Yellow” background. See Figure Q4a-2.

Select this line.  
Line 1.  
Line 2.  
**Highlight**   **Clear**

**Figure Q4a-1. Before clicking on button “Highlight”.**

Select this line.  
Line 1.  
Line 2.  
**Highlight**   **Clear**

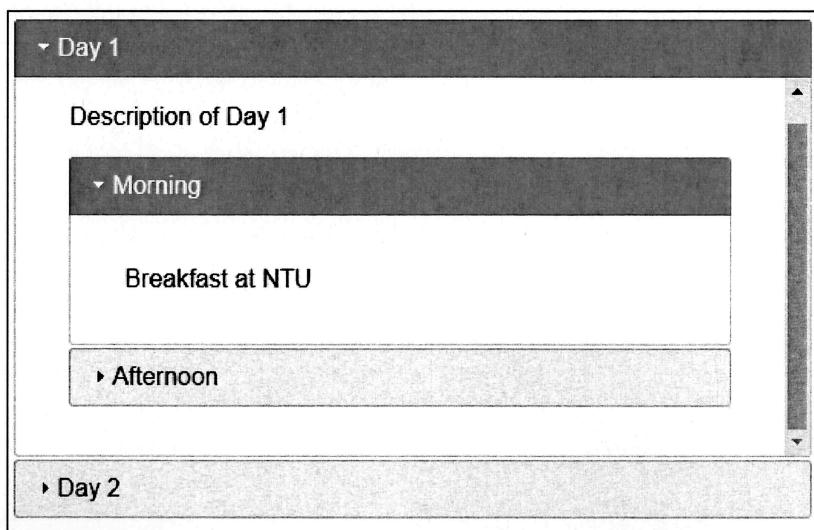
**Figure Q4a-2. After clicking on button “Highlight”.**

Write jQuery code that supports the functionality described. Part of the code is provided in Appendix Q4a.

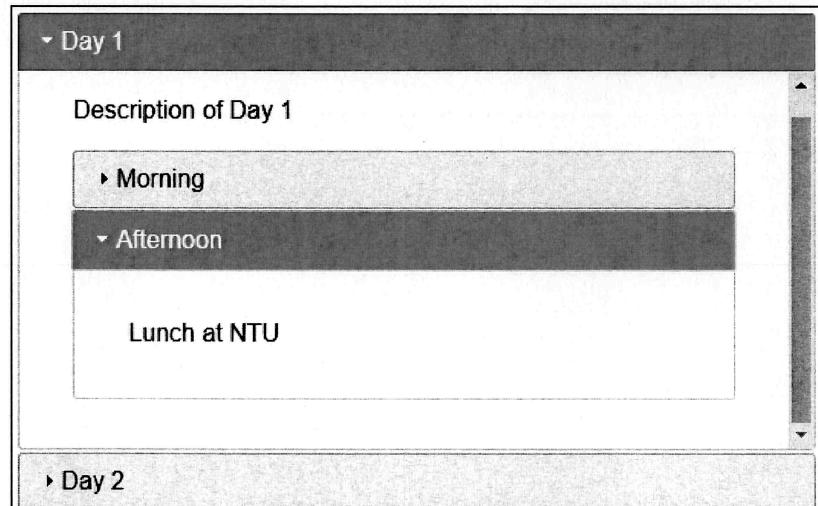
(6 marks)

**Question 4 continues on Page 7**

- (b) Figure Q4b-1 shows a HTML page with a nested accordion. The first accordion consist of 2 sections namely “Day1” and “Day2”. The nested accordion within the first accordion namely “Morning” and “Afternoon” display the text “Breakfast at NTU” and “Lunch at NTU” respectively.
- The “Day 1” section of the accordion will expose a nested accordion namely “Morning” and “Afternoon” when the “Day 1” accordion is selected. See Figures Q4b-1 and Q4b-2.



**Figure Q4b-1. ‘Morning’ section within the “Day 1” accordion.**



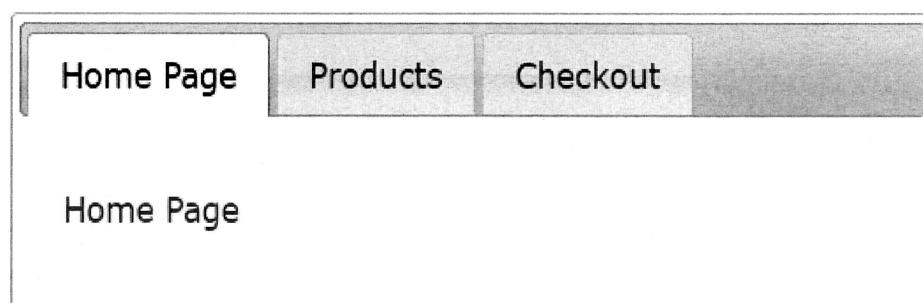
**Figure Q4b-2. ‘Afternoon’ section within the “Day 1” accordion.**

Write jQuery code that supports the functionality described. Part of the code is provided in Appendix Q4b.

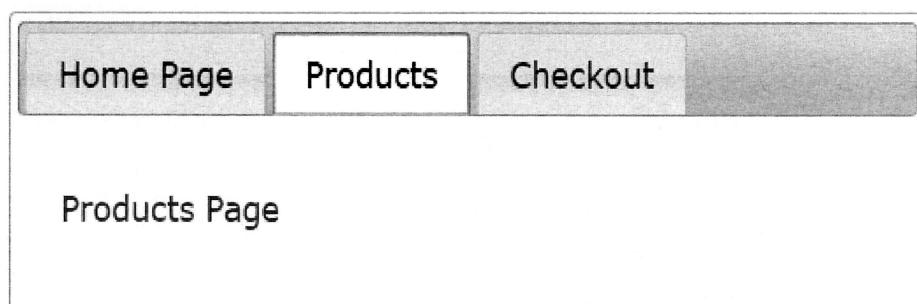
(8 marks)

**Question 4 continues on Page 8**

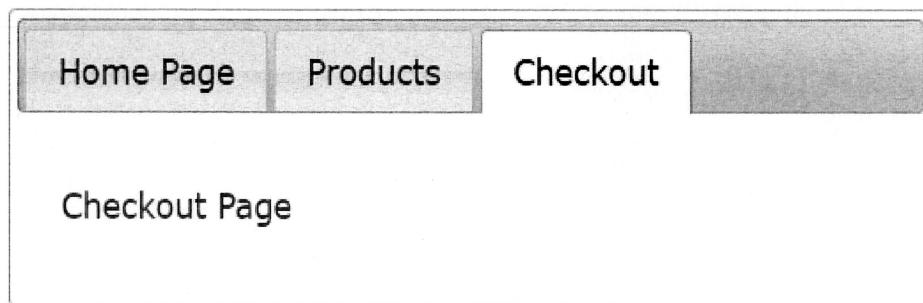
- (c) Figure Q4c-1 shows a HTML page with a single content area with multiple panels (tabs), each associated with a header in a list.
- When user clicks on “Home Page” tab, the content area will display a text “Home Page”. See Figure Q4c-1.
  - When user clicks on “Products” tab, the content area will display a text “Products Page”. See Figure Q4c-2.
  - When user clicks on “Checkout” tab, the content area will display a text “Checkout Page”. See Figure Q4c-3.
  - The HTML code is provided in Appendix Q4a.



**Figure Q4c-1. Clicking on “Home Page” tab.**



**Figure Q4c-2. Clicking “Products” tab.**



**Figure Q4c-3. Clicking “Checkout” tab.**

Write both the HTML and jQuery codes to support the functionality described above.

(6 marks)

**Question 4 continues on Page 9**

- (d) jQuery is a client-side JavaScript library designed to simplify the client-side scripting of HTML. Describe the **FOUR (4)** functionalities offered by jQuery.

(4 marks)

- (e) Explain the purpose of the code listed in Appendix Q4e. Generate necessary GUI and screens output to illustrate its key features.

(6 marks)

**END OF PAPER**





## **CI6206 INTERNET PROGRAMMING**

Please read the following instructions carefully:

- 1. Please do not turn over the question paper until you are told to do so. Disciplinary action may be taken against you if you do so.**
2. You are not allowed to leave the examination hall unless accompanied by an invigilator. You may raise your hand if you need to communicate with the invigilator.
3. Please write your Matriculation Number on the front of the answer book.
4. Please indicate clearly in the answer book (at the appropriate place) if you are continuing the answer to a question elsewhere in the book.