

NANYANG TECHNOLOGICAL UNIVERSITY

SEMESTER 1 EXAMINATION 2018-2019

CI6206 – INTERNET PROGRAMMING

November/December 2018

Time Allowed: **3 hours**

INSTRUCTIONS

1. This paper contains **FOUR (4)** questions and comprises **TEN (10)** pages and appendices of **FIVE (5)** pages, comprising a total of **FIFTEEN (15)** pages.
 2. Part One: Answer the **COMPULSORY** question. (40 marks)
 3. Part Two: Answer **TWO (2)** of the **THREE (3)** questions. (60 marks)
 4. This is a **CLOSED-BOOK** examination.
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PART ONE: Answer the COMPULSORY question.

1. **Hometutor** is a popular home-grown company that helps families to fulfil their home tuition needs by helping to match potential tutors to parents whose children are studying in primary schools. The clients of Hometutor are mainly parents as well as top quality tutors who are proficiency in their respective knowledge areas. To match the right tutor, staff of Hometutor often have to search through their long list of tutor database. Over the years, the number of parents requesting for tutoring services have doubled and this has put a strain on their staff efficiency. The company is currently looking into putting their services online so that both parents and tutors will be able to benefit from it.

Hometutor engages your service to develop an ‘Open source’ Java-based web application that allows parents to search for home tutors by academic levels as well as subjects. The project team conducted an interview session with the operation team and managed to gather the following user requirements, and intended features of the system.

Note: Question No. 1 continues on Page 2

The following web site (Hometutor.com) features are provided for the users (tutors and parents)

- Tutor Sign-up page. Tutor must first register an account in the website. The following are information that users must enter.

- (i) Register an account according to the sequence of steps

(Part A)

- **Setting a login credential**
 - a. ‘Email Address’ as user id
 - b. ‘Password’ and ‘Confirm Password’
 - c. Agree to BOTH the following terms
 - “I confirm that I am above 18 years old”
 - “I agree to the Privacy Policy on the information I provide.”
 - d. All fields are compulsory.
 - e. An email with a registration link to continue “Part B” of the sign-up.

(Part B)

- **Personal Information**
 - a. ‘Full name of the account holder’
 - b. ‘Mobile Number’ – for 2FA
 - c. “Gender”
 - d. “Race” : Chinse, Indian, Malay, Others
 - e. “Identification Number” – Passport or NRIC
 - f. Upload photo
- **Experience**
 - a. Upload academic results
 - b. Years of experience and hourly rate
 - c. Choose an option from the list
 - “A full time student”
 - “A MOE teacher”
 - “A full-time/part-time tutor
- **Preferences**
 - a. Choose preferred location to teach (May choose more than 1)
 - North, North-East, North-West, South, East, West
 - Available timeslots from Monday to Sunday.

Note: Question No. 1 continues on Page 3

- b. Choose preferred subjects and primary school level (level 1 to 6). Each level consists of the following subjects:

Primary 1 to Primary 6

- English, Maths, Chinese, Malay, Tamil

From Primary 3 onwards

- Science

Note : Tutors may choose any subjects in any level.

- Search for tutors. This feature allows registered parents to search a list of potential tutors according to parents' search criteria.
 - (i) Search criteria include
 - Child's primary school level.
 - Child's subjects to be tuition.
 - Preferred timeslots from Monday to Sunday.
 - Years of experience – as a range
 - Hourly rate – as a range
 - (ii) A list of tutors will be displayed after the “search” button is pressed. To view the detailed information of the tutor, click the name of the tutor in the search result list.
- Tutor reviews. The web site should allow registered parents to add reviews of the tutor. The following are the fields required by parents who wish to provide reviews for their tutors.
 - (i) Rate the knowledge of the tutor (No Good, Average, Good, Very Good)
 - (ii) Rate the punctuality of the tutor.
 - (iii) Write a testimonial to the tutor. (e.g. a short message with tutor's name, parent's name with subject taught and child's primary school level)
 - (iv) Comments if any.
- Login Page
 - (i) Hometutor.com is secured with 2-factor authentication: “Login & password” and “SMS OTP”.
 - (ii) Users are welcome to register for a new account if they do not have any existing account.
 - (iii) ‘Forget Password’ feature that reset and send new password to user via email – users are required to enter both email and mobile number.

Note: Question No. 1 continues on Page 4

- (a) Design **FOUR (4)** graphical user interfaces for the ‘Registration’ focusing on functionalities and user friendliness. State any assumptions clearly. (16 marks)
- (b) Design **TWO (2)** graphical user interfaces for the ‘Search the tutors’ and **TWO (2)** graphical user interfaces for the “Tutor reviews” features focusing on functionalities and user friendliness. State any assumptions clearly. (16 marks)
- (c) List and describe **TWO (2)** additional web application security features not listed in the above requirement. Explain the reasons for selecting the security features. Provide graphical user interfaces to illustrate your solution if applicable. State any assumptions clearly. (8 marks)

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

2. (a) The “HTTP GET” and “HTTP POST” are two commonly used HTTP request methods. Describe the fundamental differences between a “GET” and “POST” method in a typical HTTP communication. Explain with the help of code snippets and/or diagram how “GET” and “POST” methods should be implemented. Provide examples to support your answer. (8 marks)
- (b) 2-factor authentication (2FA) helps to prevent authentication attack over the Internet. Describe the steps required to implement the following feature if 2FA is to be used in the web application:
- Account registration
 - Forget password

Use proper diagram to illustrate your solution.

(8 marks)

Note: Question No. 2 continues on Page 5

(c) There is a server-side program (servlet) that allows user to login to Hometutor.com (Refer to Question 1 for more information). The Servlet will verify if the email and password entered is valid. Assuming all user data is stored in a database. Write Java Servlet(s) and/or JSP that meets the following specifications:

- In **Login.jsp**, registered user input the required email and password. The parameters values are sent to a servlet **LoginServlet**. The parameters can be retrieved using the **getParameter** method and **getParameterValues** method.
- There is an existing method, **DBController.verifyAccount (emailAddress, password)** that verifies if the user's email address and password exists in the database. It returns a boolean value:
 - True – if email address and password matches in the database.
 - Servlet will redirect user to verifyOTP.jsp. If the OTP entered is correct, the system will redirect user via a servlet to tutorHome.jsp if the user is a tutor and parentHome.jsp if the user is a parent.
 - False – if the credential is wrong.
 - Servlet will redirect user to Login.jsp. System should then display the message : “Account information provided is not correct. Please try again.”
 - Database Controller Method to verify OTP challenge :
 - DBController.verifyOTP(String accountID, String OTP)
 - Return ‘True’ if OTP challenge is correct. Return ‘False’ if data entered is incorrect.
- 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 process flow of an AJAX request and response from the server. List and describe **TWO (2)** advantages of using AJAX for data exchange. State any assumptions clearly.

(10 marks)

- (b) List and describe **THREE (3)** differences between AJAX and Javascript.

(6 marks)

- (c) Figure Q3c shows the “Search tutor” page in Hometutor.com used by an administrator. A JSP page **SearchTutors.jsp** allows the administrator to search and display a list of tutors according to the name of the tutor. After submitting a 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 tutors are found” is displayed instead of the table.

Search Results							
NRIC	FNAME	LNAME	Experience	Gender	Subjects	Primary	
S8934528A	Jayson	Chin	9	M	English	1	
S8934528A	Jayson	Chin	9	M	English	2	
S8934528A	Jayson	Chin	9	M	English	6	
S7723457P	Jason	Wong	3	M	English	4	
S8845239H	Jadyn	Lau	2	F	English	4	
S8845239H	Jadyn	Lau	2	F	English	3	

Figure Q3c. Search Tutors by subjects (SearchTutors.jsp)

Note: Question No. 3 continues on Page 7

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 **/SearchTutors**
- User enters the search string.
- The server-side application accepts one query string parameter named **searchString** as input field from **SearchTutors.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 a title and 2 buttons labelled as “View All Modules” and “Add Items to Year 3”.

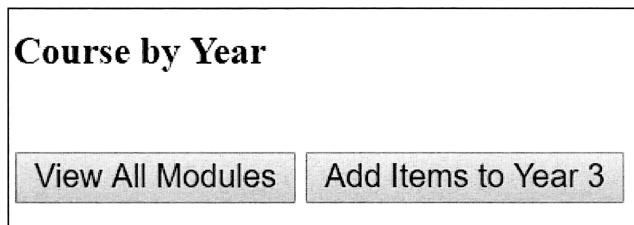


Figure Q4a-1. Before clicking on any buttons.

- Clicking on the “View All Modules” button and all the modules based on year of study will be inserted under the “Course by Year” title. See figure Q4a-2.

Note: Question No. 4 continues on Page 8

Course by Year

- Year 1
 - Introduction to Networking
 - HTML fundamental
- Year 2
 - Database Design
 - Internet Programming
- Year 3

View All Modules Add Items to Year 3

Figure Q4a-2. After clicking on button “View All Modules”.

- Clicking on the “Add Items to Year 3” button and a new text “Item 1” will be inserted under Year 3. System should not insert text “Item 1” in the absence of “Year 3” item. See figure Q4a-3.

Course by Year

- Year 1
 - Introduction to Networking
 - HTML fundamental
- Year 2
 - Database Design
 - Internet Programming
- Year 3
 - Item 1

View All Modules Add Items to Year 3

Figure Q4a-3. After clicking on button “Add Items to Year 3”.

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

(10 marks)

Note: Question No. 4 continues on Page 9

- (b) Figure Q4b-1 shows a HTML page with 2 lines of texts : “Wallet – BG Blue” and “Watch – BG Red”

My stuff

Wallet - BG Blue

Watch - BG Red.

Change Wallet Change Watch Reset

Figure Q4b-1. Before clicking on any buttons.

- Clicking on the button “Change Wallet” will ONLY cause the background color of text “Wallet – BG Blue” to change to blue color and the color of the font text changes to white. See Figure Q4b-2.

My stuff

Wallet - BG Blue

Watch - BG Red.

Change Wallet Change Watch Reset

Blue color background

Figure Q4b-2. After clicking on button “Change Wallet”.

- Clicking on the button “Change Watch” will ONLY cause the background color of text “Watch – BG Red” to change to red color and the color of the font text changes to white. See Figure Q4b-3.

My stuff

Wallet - BG Blue

Watch - BG Red.

Change Wallet Change Watch Reset

Red color background

Figure Q4b-3. After clicking on button “Change Watch”.

- Clicking on the “Reset” button will cause both lines of text “Watch – BG Red” and “Wallet – BG Blue” to change back to the original state. See Figure Q4b-1.

Note: Question No. 4 continues on Page 10

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

(10 marks)

(c) Explain the action for each of the jQuery codes.

- (i) \$(this).hide()
- (ii) \$("p").hide()
- (iii) \$(".books").hide()
- (iv) \$("#maths").hide()

(4 marks)

(d) Explain the purpose of the code listed in Appendix Q4d. Generate necessary GUI and screens output to illustrate its key feature.

(6 marks)

END OF PAPER

APPENDIX Q3

```
var request=null;
var data=null;
var READY_STATE_COMPLETE=4;

// This is the entry point for communicating with the
// server-side application. The function accepts the URL // of the application. Since the GET
method is used, any
// parameters must be included as part of the URL.

function sendRequest(url) {
    request = createRequest();
    if (request == null) {
        return;
    }
    request.open("GET", url, true);
    request.send(null);
    request.onreadystatechange = processRequestChange;
}

function createRequest() {

    var req = null;

    if (XMLHttpRequest) {
        req = new XMLHttpRequest();
    }
    else if (ActiveXObject ) {
        req = new ActiveXObject("Microsoft.XMLHTTP");
    }
    else {
        req = null;
    }
    return req;
}
```

Note: Appendix Q3 continues on Page 12

```
// This function invokes a renderData() function  
// when the server-side application has finished  
// sending its XML data to the XMLHttpRequest object.  
// You will have to implement the renderData() function  
// to display the data on the Web page.
```

```
function processRequestChange() {  
  
    if(request == null) {  
        return;  
    }  
  
    if(request.readyState == READY_STATE_COMPLETE) {  
        data = request.responseXML;  
        renderData(data);  
    }  
}
```

APPENDIX Q4a

```
<html>
<head>
<title>jQuery Radiobuttons</title>
<link rel="stylesheet" href="//code.jquery.com/ui/1.10.4/themes/smoothness/jquery-ui.css">
<script src="http://code.jquery.com/jquery-2.1.1.js"> </script>
```

... (Add additional codes here)

```
</head>
<body>
```

... HTML : Make necessary changes to the HTML

```
</body>
</html>
```

APPENDIX Q4b

```
<html>
<head>
<title>jQuery Show and Hide</title>
<link rel="stylesheet" href="//code.jquery.com/ui/1.10.4/themes/smoothness/jquery-ui.css">
<script src="http://code.jquery.com/jquery-2.1.1.js"> </script>
```

... (Add additional codes here)

```
</head>
<body>
```

... HTML : Make necessary changes to the HTML

```
<h2>My stuff</h2>
<p>Wallet - BG Blue</p>
<p>Watch - BG Red.</p>
<button>Change Wallet</button>
<button>Change Watch</button>
<button>Reset</button>
```

```
</body>
</html>
```

APPENDIX Q4d

```
<html lang="en">
<head>
    <title>child demo</title>
    <script src="https://code.jquery.com/jquery-1.12.4.js"></script>
</head>
<body>
<ul class="topnav">

    <li>English</li>
        <ul>
            <li class="1">Jayson Chui</li>
            <li class="2">Adrian Wong</li>
        </ul>

    <li>Maths</li>
        <ul>
            <li class="1">Jayson Chui</li>
            <li class="2">Angela Quek</li>
            <li class="3">Doreen Chia</li>
        </ul>

    <li>Science</li>
        <ul>
            <li class="1">Paterson Tan</li>
        </ul>
    </ul>

    <script>
$( "li + li" ).css( "border", "3px double blue" );
</script>

</body>
</html>
```

END OF APPENDICES

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.