PLEASE NOTE

This exam paper was for COMP SCI 1105, a first-year subject.
In addition, Web and Database Computing is a relatively new course covering content in a rapidly changing field.

As such, there will be major differences between the exam for the current offering of COMP SCI 2207, and past exams for Web and Database Computing.

Please consider this exam paper as an example for your reference, and NOT a guide on what content will/will not be covered in the upcoming exam.

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

Primary Examination, Semester 2, 2015

Web and Database Computing
COMPSCI 1105, 1105BR

Official Reading Time:	10 mins
Writing Time:	120 mins
Total Duration:	130 mins

Questions	Time	Marks
Answer all 6 questions	120 mins	120 marks 120 Total

Instructions

- Begin each answer on a new page in the answer book.
- Examination material must not be removed from the examination room.

Materials

- Foreign language paper dictionaries permitted.

DO NOT COMMENCE WRITING UNTIL INSTRUCTED TO DO SO

Question 1

HTML, CSS and Design

(a) The HTML shown below has two usability or accessibility errors. Identify the errors and show how you would correct them.

```
<html>
    <table>
        <tr><td>Navigation Menu</td><td>Main News Story</td></tr>
        <tr><td>Local News</td><td><img src="titleImage.gif"></td></tr>
    </table>
</html>
```

[4 marks]

(b) Draw what would be displayed in the browser window by the following HTML and CSS.

```
<head>
      <title>My First Web Page</title>
</head>
<body>
       <div>
           <h1>Section 1</h1>
           <p>This is the beginning of the description </p>
       </div>
           <h1>Section 2</h1>
 </body>

h1 {font-size:18pt; text-decoration: underline; font-color: red}
div {font-style: italic}
```

[5 marks]

(c) i. Explain why it is easier for a beginner to use a graphical user interface (GUI) than a command line prompt?

[2 marks]

ii. How do CSS rules help to reduce a user's cognitive load when interacting with a web site?

[3 marks]

(d) Explain the difference between the *class* and *id* selectors. Explain a situation when a HTML tag needs to be assigned both an id selector and a class selector?

[5 marks]

[Total for Question 1: 19 marks]

Question 2

Client Server communication - HTTP

(a) What does AJAX stand for and what is it used for?

[4 marks]

(b) The code below uses AJAX to send authentication information to the server

```
function authToServer(auth, callback) {
    var authReq = new XMLHttpRequest();

    authReq.onreadystatechange = function() {
**      if (authReq.readyState==4 && authReq.status==200) {  **
            console.log('logged in with server');
            callback();
        }}
    authReq.open("POST", "http://localhost:3000/auth", true);
    authReq.setRequestHeader('Content-Type', 'application/json');
    authReq.send(JSON.stringify(auth));
}
```

i. Explain the purpose of the line marked with **. Why is this condition necessary?

[5 marks]

ii. Why is POST used instead of GET in the code?

[2 marks]

iii. What security vulnerability does this authentication code have?

[3 marks]

(c) When communicating with our web server, we typed the URL `http://localhost:3000/` into the browser address bar. Explain what do 'localhost' and '3000' mean?

[3 marks]

(d) Suppose your *friend finder* application server receives a request for friend data. In what situation should the server return the following HTTP status codes?

i. 200

[1 mark]

ii. 404

[1 mark]

iii. 500

[1 mark]

[Total for Question 2: 20 marks]

Question 3

Web App Programming

(a) Consider the web-page described by this HTML:

```
<!DOCTYPE HTML>
<html>
    <head>
        <meta charset="UTF-8">
        <title>DOM and javascript</title>
    </head>
    <body>
        <button type="button" onclick="action1(event)">
            Do action 1
        </button>
        <button type="button" onclick="action2(event)">
            Do action 2
        </button>
        <script src="Scripts/dom.js"></script>
    </body>
</html>
```

i. What would cause the function below to be called? Draw what the web page will look like after the function is called.

```
function action2(e) {
    var newNode = document.createElement("button");
    var text = document.createTextNode("hello");
    newNode.appendChild(text);
    document.body.appendChild(newNode);
}
```

[4 marks]

ii. Suppose we want the page to behave in such a way that the `action2(e)` handler is called whenever the mouse cursor is over the first button. What changes would need to be made to the HTML?

[2 marks]

(b) Explain the contents of a DOM hierarchy. How do these contents relate to object-oriented programming methodology?

[4 marks]

(c) Web pages can be generated dynamically at either the client side or the server side. Explain when a page should be generated by the server and when a page should be generated by the client.

[4 marks]

(d) Explain the role of *middleware*. Give an example of middleware.

[2 marks]

(e) i. What is a ”cookie”?

[2 marks]

ii. When would you use a ”cookie” in a web application?

[2 marks]

[Total for Question 3: 20 marks]

Question 4

Third Party APIs

(a) Explain the role of long and short term tokens in the authentication process in Facebook. Include in your answer how long and short term tokens are obtained and how they are used. You may wish to draw a diagram to show the requests and responses between the client, Facebook and server.

[6 marks]

(b) How do Facebook *permissions* provide privacy to users? How does your application get the permissions it needs?

[3 marks]

(c) Explain how Facebook stores information about you and your friends. Explain how you would access information such as photos in which you are tagged.

[4 marks]

(d) Examine the code given below:

```
var adelaideBounds, marker, infoWindow, map;

function initialize() {
    var Adelaide = new google.maps.LatLng(-34.9290, 138.6010);

    adelaideBounds = new google.maps.LatLngBounds(
          new google.maps.LatLng(-34.943481, 138.577672),
          new google.maps.LatLng(-34.865488, 138.660756));

    var mapOptions = {
        center: Adelaide,
        zoom: 10
    };
    map = new google.maps.Map(
                  document.getElementById("map-canvas"),  *****
                  mapOptions);
    marker = new google.maps.Marker({
            position: Adelaide,
            title: "Adelaide!",
            draggable: true,
            map: map
        });
    infoWindow = new google.maps.InfoWindow({
            content: "You have found Adelaide",
        });
    google.maps.event.addListener(marker, 'dragend', checkAdelaide);
}

function checkAdelaide() {
    if (adelaideBounds.contains(marker.getPosition())) {
        infoWindow.open(map,marker);
        marker.setAnimation(google.maps.Animation.BOUNCE);
    } else
        marker.setAnimation(null);
}
google.maps.event.addDomListener(window, 'load', initialize);
```

(e) Explain what the code will do. Be as detailed as possible describing how a user could interact with the map and exactly what would be displayed.

[8 marks]

[Total for Question 4: 21 marks]

Question 5

Databases

(a) What is the role of a *primary key* in the relational database model?

[2 marks]

(b) Develop an Entity Relationship (ER) model for the scenario given below.
One or more text books is recommended for each course. Each text book is used in at least one course. A text book is identified by a unique ISBN. Its title, authors, publisher and the year of publication are known. Each course has a unique code.

[9 marks]

(c) Derive a relation schema for your ER model. Indicate the primary keys and foreign keys using the standard notation.

[9 marks]

(d) Given the following specification for adding an SQL CHECK constraint:

```
ALTER TABLE table_name ADD constraint_name (columnA, columnB);
```

Write an SQL command that will add a constraint to make *ISBN* a primary key of the TEXT-BOOK table.

[3 marks]

(e) Write a query to extract the names of all the text books recommended for COMP SCI 1105.

[4 marks]

[Total for Question 5: 27 marks]

Security

Question 6

(a) Are *ALL* web applications susceptible to SQL injection attacks? Explain.

[3 marks]

(b) Describe an ethical issue in the friend finder application and how you would resolve this issue.

[5 marks]

(c) Explain Cross-Site Scripting (XSS).

[3 marks]

(d) How can you avoid XSS attacks?

[2 marks]

[Total for Question 6: 13 marks]

End of exam