THE UNIVERSITY of ADELAIDE

Primary Examination, Semester 1, 2017

Web and Database Computing
COMPSCI 2207, 7207

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

Questions	Time	Marks
Answer all 7 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

- Paper dictionaries permitted.

DO NOT COMMENCE WRITING UNTIL INSTRUCTED TO DO SO

Question 1

HTML, CSS and Design

(a) An HTML document contains text and *tags*. What is the format of a *tag*, what is it for? What is an *attribute* of a tag? Give an example about *tag attribute*.

[4 marks]

(b) The World Wide Web Consortium recommends that all style information about a document should be stored in a separate style sheet. Explain two reasons for this recommendation.

[4 marks]

(c) 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?

[4 marks]

(d) 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>Here is the first introduction </p>
       </div>
           <h1 class="normal">Section 2</h1>
 </body>
```

```
body {
    font-style: italic;
}

h1 {
    font-color: blue;
    font-size: large;
    text-decoration: underline;
}

.normal {
    font-style: normal;
}
```

[6 marks]

(e) In CSS, the *display* property is the most important CSS property for controlling layout. Every HTML element has a default value depending on what type of element is. The default display value for most element is *block* or *inline*. Please classify the following elements into the two categories by their default display value: <p>, <a>, <h2>, <img>.

[4 marks]

[Total for Question 1: 22 marks]

Question 2

Dynamic Web Page - Javascript

(a) Using only HTML results in a static web page. Please list at least *four* reasons why we might want a web page to be dynamic.

[4 marks]

(b) Suppose, there is a button <button id="myId">clickMe</button> in an HTML file, and there is a javacript function *myFunc* which should be called after a user clicks the button. What is the javacript code to register the function *myFunc* to the *click* event using DOM? What is the jQuery code for the same job?

[4 marks]

(c) In many applications, a user's input needs to be validated before or after it is sent to a server. If the input is not legal, the user may be asked to enter it again. Please describe what kind of validation should be done at the client side, and what kind of validation should be done at the server side, explain the reasons, and give one example each.

[6 marks]

[Total for Question 2: 14 marks]

Question 3

Client Server communication - HTTP

(a) What is the purpose of AJAX (Asynchronous Javascript and XML)?

[2 marks]

(b) Give an example of a situation where you would need to use AJAX instead of a standard web form.

[2 marks]

(c) What will be displayed in the console when the function AJAX () is called? Assume that the server returns a 500 server error response.

```
function AJAX( ) {

    var updateRequest = new XMLHttpRequest();

    updateRequest.onreadystatechange = function() {
        if (updateRequest.readyState==4) {
           if (updateRequest.status == 200) {
              console.log("updated count");
          }
          else {
             console.log("error");
          }
      else {
           console.log("processing....");
      }
    };

    updateRequest.open("POST",
                       'http://localhost:3000/changeCount',
                       true);

    updateRequest.setRequestHeader('Content-Type', 'application/json');
    updateRequest.send(JSON.stringify({"newCount":0}));
};
```

[4 marks]

(d) Which of the following are valid JSON? (note that more than one may be valid, no variables are being used and there is a 0.5 mark penalty for selecting any invalid JSON)

1. `{"name":"John", "age":23, "friends":["Cathy", "Josh", "Mingyu"]}`
2. `{"name":"John", "age":"23", "friends":["Cathy","Josh","Mingyu"]}`
3. `{"name":"John", "age":23, "friends":("Cathy", "Josh", "Mingyu")}`
4. `("name":"John", "age":23, "friends":["Cathy", "Josh", "Mingyu"])`
5. `{"name":"John", "age":23, "friends":[Cathy, Josh, Mingyu]}`
6. `{"name":"John", "age":23, "friends":"Cathy", "Josh", "Mingyu"}`

[3 marks]

(e) Write an example JSON representation for the following data: A list of friends called "myFriends". Each friend in the list is an object containing the friends name and favourite colour. Your example should include 2 friends.

[4 marks]

(f) What is the difference between an HTTP POST and an HTTP GET? Give an example of when each would be used.

[4 marks]

(g) What is the default port number used for connecting to web servers?

[1 mark]

(h) What general types of errors are represented by 4XX codes? 5XX codes? In your answer give an example of each type of error.

[3 marks]

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

[3 marks]

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

[2 marks]

[Total for Question 3: 28 marks]

Question 4

Server Side Programming

(a) An express server has a route defined as shown below:

```
router.get('/count', function(req, res) {
        res.send(count);
});
```

i. If the express server were running on the host `web.node.com` on port 8080, what would you need to type into the browser to call this route?

[2 marks]

ii. What do the variables `req` and `res` represent?

[2 marks]

iii. What changes would you make to the code if you wanted to return the count as the JSON

```
{"currentCount":count}
```

[2 marks]

(b) 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]

(c) What are each of the following *express* directories used for?

1. public
2. views
3. routes
4. bin

[2 marks]

[Total for Question 4: 12 marks]

Question 5

Third Party APIs

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);
```

i. Explain the purpose of the line `document.getElementById("map-canvas")`, marked with ***** in the code above. What does this line do?

[3 marks]

ii. Explain the line map:map (Hint: what does the first word `map` refers to? What does the second word `map` refers to?)

[2 marks]

[Total for Question 5: 5 marks]

Databases

Question 6

(a) Explain the difference between a *primary key* and a *foreign* key for a database table in the relational database model.

[4 marks]

(b) A database is needed for a DVD store. The database should contain the following information:

- Customer ids, names (first and last) and addresses.
- Date and time each DVD was hired and the customer who hired the DVD
- Title and year of production of each DVD

i. Construct an E-R model for the above scenario.

[8 marks]

ii. Derive a relational schema for the DVD store described above.

[8 marks]

iii. What primary key would you choose for the DVD table? Explain your choice.

[4 marks]

iv. Write a query to get a list of the DVD titles hired by a given customer.

[3 marks]

[Total for Question 6: 27 marks]

Security

Question 7

(a) Which of the following is the most common source of security issues in web applications: user input, weak passwords, code errors (e.g. buffer overflow errors) or failure to update software libraries?

[2 marks]

(b) For each of the web application security risks given below, explain the attack and how to prevent the attack.

i. Cross-Site Scripting (XSS)

[5 marks]

ii. SQL injection

[5 marks]

[Total for Question 7: 12 marks]

End of exam