

THE UNIVERSITY OF WARWICK

First Year Examinations: Summer 2016

Web Development Technologies

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Time allowed: 1.5 hours

Answer **FOUR** questions.

Read carefully the instructions on the answer book and make sure that the particulars required are entered on each answer book.

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1. The HyperText Markup Language (HTML) is an example of a semantic markup.
  - (a) Define the term semantic markup. [2]
  - (b) Why is it important to write valid HTML? [3]
  - (c) Write a short document that is valid HTML 5. [5]
  - (d) Cascading Style Sheets (CSS) support the styling of HTML documents.
    - i. Describe with the aid of an example the different ways in which styling can be applied to elements. [3]
    - ii. Which of the methods in part 1(d)i promotes best reuse of styles? [2]
  - (e) Online system typical communicate with other online systems using common data exchange formats.
    - i. Describe with the aid of an example two common data exchange formats used on the Web. [8]
    - ii. What are the advantages of using common data exchange formats? [2]

2. Many programming languages and technologies can be combined in the development of web applications.

- (a) **GET** and **POST** requests allow you to receive data sent from a client. Explain the difference between GET and POST requests and describe situations where each is best suited. [4]
- (b) Given the PHP code in listing 1, write secure implementations for the missing methods *storePassword*, *checkPassword*. You may use the *readColumn* and *writeColumn* to read or write values to the database. You may define additional methods if you wish. [8]

Listing 1: PHP User Class

```
<?php
class User {
    public storePassword($newPassword) {
        //You need to implement this.
    }

    //returns true if the
    //password matches stored value
    public checkPassword($password) {
        //You need to implement this.
    }

    //You may use the methods below, which will read
    //and write individual columns to the database.

    //Returns the value of the read column.
    private readColumn($columnName) { ... }

    private writeColumn($columnName, $value) { ... }
}
?>
```

- (c) Structured Query Language (SQL) queries are subject to injection attacks. Write a query that is susceptible to an attack, and suggest **two** ways to mitigate it. [3]
- (d) Javascript enables the creation of interactive documents through its event model. Describe with the aid of an example how events on an element are triggered, and any side effects of the process. [5]
- (e) Javascript is often used for form validation. Do you think that this validation is sufficient for your applications? Explain your reasoning. [2]
- (f) Execution of Javascript is often deferred until the document is loaded. Explain the mechanism for this process and why this is required. [3]

3. Security must be considered at multiple levels in a Web application.

- (a) The HyperText Transport Protocol (HTTP) is a protocol for requesting data on the Web.
  - i. HTTP is a stateless protocol. Explain why HTTP is stateless. [1]
  - ii. Explain how state is maintained by applications that communicate over HTTP. [3]
- (b) Describe the process of setting up a HTTPS connection [10]
- (c) What is the role of a Certificate Authority (CA) and why do we need them? [2]
- (d) Describe how a user's session may be hijacked by a malicious user. [4]
- (e) Explain how Cross Site Scripting (XSS) may be used to inject malicious content into a page, and suggest how it can be prevented. [5]

4. Users with a wide range of abilities may access your application.

- (a) The Web Content Accessibility Guidelines (WCAG) specify how to make content accessible.
  - i. Explain how conformance to the criteria is graded with the aid of an example. [2]
  - ii. Why might it not be feasible to achieve a top grade? [3]
- (b) Describe **five** different disabilities, and suggest **one** method or technique to assist users with these conditions. [10]
- (c) The **think aloud protocol** is one method for conducting a usability test. Describe the process and its advantages and disadvantages. [10]

5. Application architecture and infrastructure strategy can have serious implications on the performance of Web Applications.
- (a) The Domain Name System (DNS) is an essential component of the Internet.
    - i. Explain how the domain `www.wikipedia.com` is resolved. [4]
    - ii. To prevent overloading of the system, various DNS caches exist. Describe which caches may be used when looking up a domain. [4]
    - iii. How does the time-to-live (TTL) affect caching of DNS entries? [2]
  - (b) Define the terms **response time** and **perceived response time**. [2]
  - (c) Asynchronous JavaScript and XML (AJAX) techniques can improve the perceived response time of an application. Explain how this works with the aid of an example. [4]
  - (d) Sketch a graph of throughput against concurrent requests, and describe the distinct regions. [3]
  - (e) Scaling out and scaling up are two strategies for increasing the service capacity of web applications. Define each of these terms, and give advantages and disadvantages of each. [6]
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