Three hours

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Web Technology and Practice 2

QUESTION PAPER MUST NOT BE REMOVED FROM THE EXAM ROOM

Date: Wednesday 28th May 2008

Time: 09:45 – 12:45

Please answer ALL Questions in Section A (40 marks available)

Answer ONE Question in Section B (20 marks available)

and ONE Question in Section C (20 marks available)

Use a separate answerbook for EACH section

The use of electronic calculators is NOT permitted
Section A

Compulsory multi-part question—Answer all parts (40 marks)

A1. Give 5 advantages of XML over HTML. (5 marks)

A2. In an XML Schema, when do you use xsd:complexContent and when xsd:simpleContent? (5 marks)

A3. Consider the following XML Schema (lines are numbered for ease of reference):

```xml
(1)  <?xml version="1.0"?>
(2)  <xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
(3)      targetNamespace="http://www.juicers.org"
(4)      xmlns="http://www.juicers.org"
(5)      elementFormDefault="qualified">
(6)      <xsd:element name="juicers">
(7)          <xsd:complexType>
(8)              <xsd:sequence>
(9)                  <xsd:element name="juicer" minOccurs="0" maxOccurs="unbounded">
(10)                 <xsd:complexType>
(11)                     <xsd:sequence>
(12)                         <xsd:element name="name" type="xsd:string"/>
(13)                         <xsd:element name="image" type="imageType"/>
(14)                         <xsd:element name="description" type="xsd:string"/>
(15)                         <xsd:element name="warranty" type="xsd:string" minOccurs="0"/>
(16)                         <xsd:element name="weight" type="xsd:positiveInteger" minOccurs="0"/>
(17)                         <xsd:element name="cost" type="money" maxOccurs="unbounded"/>
(18)                         <xsd:element name="retailer" type="xsd:anyURI"/>
(19)                         </xsd:sequence>
(20)                     </xsd:complexType>
(21)                 </xsd:complexType>
(22)              </xsd:sequence>
(23)          </xsd:complexType>
(24)      </xsd:element>
(25)  </xsd:complexType>
(26)  </xsd:simpleType>
(27)  </xsd:restriction base="xsd:decimal">
(28)  <xsd:restriction digits value="2"/>
(29)  </xsd:restriction>
(30)  </xsd:simpleType>
(31)  <xsd:simpleType name="imageType">
(32)      <xsd:restriction base="xsd:string">
(33)          <xsd:pattern value="(.+)\.(gif|jpg|jpeg|bmp)"/>
(34)      </xsd:restriction>
(35)  </xsd:simpleType>
(36) </xsd:schema>
```
i) Modify this schema to create a new global type called “appliance”. (2 marks)

ii) Add declarations within “appliance” for “description” and “guarantee”. (1 mark each)

iii) Create a new global type called “juiceAppliance”, which must be derived from “appliance” by extension. (5 marks)

iv) Make “juicer” of type “juiceAppliance” (1 mark)

You need not reproduce the entire schema. It is sufficient to show the detail of the changes you would make, indicating where in the schema any additions would be made. (10 marks total for A3).

A4. Give 3 examples of data and 3 examples of software resources that can be usefully shared on the Web. (5 marks)

A5. Give an example of a URL. List the three main components of URL, stating how their boundaries are denoted and illustrating each one from your example. To what extent is a URL location transparent? (5 marks)

A6. What is a communication protocol? Explain the two important parts that define a protocol. (5 marks)

A7. Web service technology provides a means for programs (other than Web browsers) to access services on other computers. Explain how a Web service is developed, deployed, and used (in terms of the W3C Web service standards used). (5 marks)
Section B

Answer ONE question in this Section

B1. Compare traditional page-driven Web applications with the emerging data-driven Web applications (developed using AJAX technology) in terms of rich user experience:

a) What do we mean by rich user experience in software applications (taking desktop applications as examples)? (5 marks)

b) Why is rich user experience very limited in traditional Web applications? (7 marks)

c) Why can rich user experience in Web applications be provided by AJAX technology? (8 marks)

B2. a) What is the role of DNS in Web architecture? How does caching help a name service’s availability? (5 marks)

b) List the three main software components that may fail when a Web browser tries to make a request on a Web server, giving an example of a failure in each case. (5 marks)

c) Referring to the failure model of distributed systems, what types of failures might distributed systems experience? In your answer, provide a brief description of each type of failure. (5 marks)

d) With reference to security of systems, briefly describe the types of threat facing principals and the communication channel between them. (5 marks)
C1. a) Consider the following instance of an XML document, and its HTML transform.

XML document instance

```xml
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="do2student.xsl"?>
<students>
  <student name="Puranna Wistchill">
    <degree>
      Internet Technologies
    </degree>
    <course code="1234">
      Programming by Stealth
    </course>
    <course code="2345">
      Internet Secrets
    </course>
  </student>
  <student name="I.M. Dreemng ">
    <degree>
      Software Engineering
    </degree>
    <course code="1234">
      Programming by Stealth
    </course>
    <course code="3456">
      Requirements Capture
    </course>
    <course code="0123">
      Human Computer Interaction
    </course>
  </student>
</students>
```

(Question C1 continues on the following page)
Write the XSL stylesheet do2student.xsl that would produce the HTML transform from the XML instance. The XSL Transform namespace is 
http://www.w3.org/1999/XSL/Transform.  

(Question C1 continues on the following page)
b) The company you work for has a web application connected to a back-end database. The application reads from the database, constructs a DOM tree and generates real-time reports from this tree that are displayed to users. Over time, the database has grown in size. The amount of memory available remains limited. As a result, report generation is taking longer. Your team has been tasked with improving performance while retaining the functionality of the application. The following proposals are made at a meeting, and you are asked to write a report that considers each proposal and recommends, with appropriate justification, the best solution or combination of solutions. The proposals are:

i) Transmit the XML document directly to the web browser which then takes care of processing the document.

ii) Change the application's parser to SAX instead of DOM.

iii) Time is being wasted as the XML documents are verbose, therefore, we should reduce the number of elements by converting some to attributes of other elements instead.

iv) Modify the application to regularly generate the reports as HTML documents and transmit the HTML documents to the browser. (10 marks)

C2. a) JavaServer Pages (JSP) is a server-side programming language. Explain what this means and explain how a web page is constructed in the JSP paradigm and sent to the client. (5 marks)

b) Sun's foremost goal for JavaServer Pages (JSP) was about separating content generation from presentation. To what extent do you judge that JSP technology supports developers and designers in this respect? Justify and exemplify your answer. (15 marks)