

Birkbeck  
(University of London)

MSc and MRes Examination for Internal Students

*MSc in Advanced Information Systems*  
*MSc in Intelligent Information Systems*  
*MSc in Web Information Management*  
*MRes in Computer Science*  
*MSc in E-Business*

School of Computer Science and Information Systems

Development of Internet Applications (COIY032P)

Date of examination: Monday 4 June 2007

Duration of paper: 14:30–16:30

*There are six questions on this paper. Candidates should attempt any FOUR of them. Calculators are not permitted.*

1. (a) What is the main function of the W3C Internationalization Activity, and how do Unicode and UTF-8 relate to this? (8 marks)
- (b) Explain the concept of a *mixed content model* in XML and give an example of a mixed content model declaration in a DTD. How is a mixed content model indicated in the XML schema definition language? (6 marks)
- (c) What does it mean to say that an XML document is *valid*? (2 marks)
- (d) Consider an XML document representing information about winners of the Booker prize. The root element is `booker` which has one or more `award` child elements. Each `award` element has `author`, `title` and `year` child elements. Assuming no initial context has been set, express the following two queries in XPath: (i) find the title of the book that won in 2000, and (ii) find the author of the book with title "Amsterdam" that won in 1998. (9 marks)
  
2. (a) Write down the declarations for a DTD necessary to represent information about the stock held by a car dealer in XML. The stock of the dealer comprises any number of new cars and used cars. For a new car, information on model and price are recorded. For a used car, information on model, mileage and price are recorded, along with optional information about the condition of the car. The price must have a currency associated with it. The condition is either `excellent` or `good`.  
In what ways would the XML schema definition language provide greater flexibility or precision in the required declarations? (13 marks)
- (b) Explain the relationships among URIs, URNs and URLs. (5 marks)
- (c) Explain the function of the DOM method `getElementByTagName`. If such a method were not provided, what other DOM methods could be used and how would they be used to provide similar functionality. (7 marks)
  
3. (a) Consider the following two element declarations from an XML DTD:
 

```
<!ELEMENT CD (composer, (performance)+, (length)?)>
<!ELEMENT performance (composition, (orchestra, conductor)?)>
```

 where all elements not declared are assumed to have content models of `#PCDATA`. Write down the XML schema declarations equivalent to the above DTD. (16 marks)
- (b) Write a javascript script that asks the user to enter two numbers, obtains the two numbers from the user and outputs HTML text that displays the larger number followed by the words "is larger". If the numbers are equal, output HTML text that displays the message "The numbers are equal". (9 marks)
  
4. (a) Consider the following XML document:
 

```
<?xml version="1.0"?>
<!DOCTYPE tree [
<!ENTITY one "<node>a</node>">
<!ENTITY two "<node>&one;&one;</node>">
<!ENTITY four "<node>&two;&two;</node>">
]>
<tree>&four;</tree>
```

 Write down the structure of the XML document after it has been parsed. (4 marks)
- (b) Describe the syntax of an XML namespace declaration. Given a namespace declaration, what is its *scope*? (6 marks)
- (c) Explain the meaning of the terms *persistent connection* and *pipelining* with respect to the HTTP protocol. What are the advantages and consequences of each? (15 marks)

5. (a) Assuming a particular context node *c* in an XML document, explain which nodes are considered to be included in (i) the **descendant** axis and (ii) the **following** axis with respect to node *c*, according to the XPath language. Your explanation should be in terms of the start and end tags appearing in the document. (6 marks)
- (b) Consider the following fragment from an XML schema definition.
- ```
<xsd:element name="zipcode">
  <xsd:simpleType>
    <xsd:restriction base="xsd:string">
      <xsd:pattern value="\d{5}(-\d{4})?" />
    </xsd:restriction>
  </xsd:simpleType>
</xsd:element>
```
- Describe the values that would be allowed as the contents of a **zipcode** element in an XML document conforming to this schema fragment. (4 marks)
- (c) Define the term *session*. Describe 3 methods that are used to maintain sessions using HTTP. (15 marks)
6. (a) Name two well-known XML vocabularies, other than XHTML and RSS. (2 marks)
- (b) Consider an RSS document in which a **title** element can occur in various places: as the child of a **channel**, **image** or **item** element. In addition, each **item** element has a **description** child element. Assume that we want to transform an RSS document into an HTML document so that the **title** elements are transformed as follows. The **title** of a **channel** is output as the contents of an **h1** heading. The **title** of an **image** is not output. The **title** of an **item** is output as the contents of a **p** element, with the **description** of the **item** being output after its **title** and the character “:”. Write the XSLT stylesheet template rules necessary to perform the transformation. Do not include the top-level **stylesheet** element. (14 marks)
- (c) In HTTP/1.1, what is meant by *content negotiation* and why is it useful? (9 marks)