

**Birkbeck
University of London**

MSc E-Commerce

Development of Internet Applications

Wednesday 28th May 2003 (14:30–16:30)

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

1. (a) Explain the relative advantages and disadvantages of doing XSLT processing on the client machine and the server machine. (8 marks)
- (b) Write a Javascript program which will prompt the user for a number of student marks and will output the average mark. The program should prompt the user for each mark, using a mark value of -1 to indicate that no more marks are to be entered. Once all marks have been entered by the user, the program should output the following HTML:

```
<p>The average mark is ??</p>
```

with ?? replaced by the appropriate value. (12 marks)
- (c) Explain the use of attributes of type ID and IDREF in XML. State the conditions that must be fulfilled by an XML document that uses attributes of these types in order for the document to be valid. (5 marks)

2. (a) Consider the following DTD:

```
<!DOCTYPE group [  
<!ELEMENT group (person*)>  
<!ELEMENT person (name)>  
<!ELEMENT name (#PCDATA)>  
<!ATTLIST person  
  id      ID      #IMPLIED  
  spouse  IDREF   #IMPLIED>  

  - i. What do the keywords #PCDATA and #IMPLIED mean? (3 marks)
  - ii. What does the operator * mean? (1 mark)
  - iii. Given a document valid with respect to the above DTD, give XPath expressions (assuming no initial context) which will return (A) the person whose spouse is named 'John', and (B) the person who is the spouse of the person named 'Janet'. (6 marks)
```
- (b) Explain the relative advantages and disadvantages of CGI and Java servlets as server-side technologies. How do ASP and JSP differ from CGI and servlets? (15 marks)

3. (a) Explain 5 major differences between the e-commerce solutions being developed today and traditional EDI solutions. (10 marks)
- (b) Assume that we want to define an XML document type that contains elements `billingAddress` and `deliveryAddress`. Both elements are to contain the same information represented using elements, namely, `houseNumber` or `houseName`, `street`, an optional `village`, and `town`. You can assume that each of these elements is of type string. Without repeating the content model definitions for `billingAddress` and `deliveryAddress`, give the necessary declarations as part of (i) a DTD, and (ii) an XML schema. (15 marks)

4. (a) Name 3 differences between HTML and XHTML. (3 marks)
- (b) Consider the following simplified XML document:

```
<lecture id="e1">
  <slide id="e2">
    <figure id="e6"/><figure id="e7"/>
  </slide>
  <slide id="e3">
    <figure id="e8"/>
    <list id="e9">
      <item id="e11"/><item id="e12"/>
    </list>
  </slide>
  <slide id="e4">
    <figure id="e10"/>
  </slide>
  <slide id="e5"/>
</lecture>
```

- i. Assuming that the list element with id value e9 is the context node, give the id values of those nodes on the (A) ancestor, and (B) preceding XPath axes. (6 marks)
- ii. Now consider transforming XML documents like the above to HTML as follows. Whenever a `figure` is encountered, an HTML paragraph containing "Figure to go here" is output. A horizontal rule is output after each slide. A `list` element is transformed into an HTML unordered list, while `item` elements are transformed to HTML list items. The contents of a list item is the value of the id attribute of the corresponding `item` element. All other id values in the input are ignored. The above document would be transformed to the following:

```
<html>
  <p>Figure to go here</p>
  <p>Figure to go here</p>
  <hr />
  <p>Figure to go here</p>
  <ul><li>e11</li><li>e12</li></ul>
  <hr />
  <p>Figure to go here</p>
  <hr />
  <hr />
</html>
```

Write a set of XSLT template rules to perform the transformation described above. You can assume that `figure` and `item` elements are always empty, and that `list` elements only have `item` elements as children. (16 marks)

5. (a) Consider the following fragment of XML:

```
<book xmlns="http://www.abc.com">
  <author xmlns="http://www.xyz.com">
    <lastname>Coetzee</lastname>
    <title>Professor</title>
  </author>
  <title>Disgrace</title>
</book>
```

For each of the 5 elements above, state which namespace it is in. (5 marks)

- (b) In HTTP/1.1, what is meant by *content negotiation* and why is it useful? (9 marks)
- (c) Describe the 3 main components of a Web services architecture, naming the languages commonly used to implement each component and explaining how the components interact. (11 marks)
6. (a) Describe 3 means by which user-derived data types can be defined in XML schema. (6 marks)
- (b) Assuming some context node, explain precisely what the following XPath expressions return: (i) `performance[not(soloist)]`, and (ii) `performance[soloist][2]`. (6 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)
- (d) Give three reasons for caching content on the Internet. With respect to caching, what is meant by *semantic transparency*? (6 marks)