CSc 8711, Databases and the Web **Name:** _____
Fall 2001, Exam
25 October 2001

1. Define the following simple types in XML-Schema:

   (a) A type whose domain consists of lists of strings, where each list consists of 7 elements.

   (b) A type whose domain consists of lists of strings, where each string has between 7 and 10 characters and each list has between 7 and 10 elements.

   (c) A type appropriate for letter grades that students receive on completion of a course (A, A-, B+, B, B-, C+, C, C-,D,F). Express this type in two different ways: as an enumeration and using the pattern tag of XML Schema.

2. Write an XML Schema for the bibliography XML data of Project 5 (sample shown below).

```
<Journals>
  <Journal>
    <JournalName>ACM Transactions on Database Systems</JournalName>
    <Volumes>
      <VolumeEntry>
        <Volume>1</Volume>
        <Year>1976</Year>
        <Numbers>
          <NumberEntry>
            <Number>1</Number>
            <Date>March 1976</Date>
            <Articles>
              <Article>
                <Authors>
                  <Author>M. Stonebraker</Author>
                  <Author>D. Maier</Author>
                </Authors>
                <Title>Ingres: A Database Management System</Title>
                <StartPage>1</StartPage>
                <EndPage>18</EndPage>
              </Article>
              ...
              ...
          </NumberEntry>
          ...
          ...
        </Numbers>
      </VolumeEntry>
      ...
      ...
    </Volumes>
  </Journal>
  ...
  ...
<Journals>
```

3. Consider the following XML data:

```
<Report Date="2000-12-12">
  <Students>
    <Student StudId="111111111">
      <Name><First>John</First><Last>Doe</Last></Name> <Status>U2</Status>
      <CrsTaken CrsCode="CS308" Semester="F1997"/>
      <CrsTaken CrsCode="MAT123" Semester="F1997"/>
    </Student>
    <Student StudId="666666666">
      <Name><First>Joe</First><Last>Public</Last></Name> <Status>U3</Status>
      <CrsTaken CrsCode="CS308" Semester="F1994"/>
      <CrsTaken CrsCode="MAT123" Semester="F1997"/>
    </Student>
    <Student StudId="987654321">
      <Name><First>Bart</First><Last>Simpson</Last></Name> <Status>U4</Status>
      <CrsTaken CrsCode="CS308" Semester="F1994"/>
    </Student>
  </Students>
  <Classes>
    <Class>
      <CrsCode>CS308</CrsCode> <Semester>F1994</Semester>
      <ClassRoster Members="111111111 987654321"/>
    </Class>
    <Class>
      <CrsCode>CS308</CrsCode> <Semester>F1997</Semester>
      <ClassRoster Members="111111111"/>
    </Class>
    <Class>
      <CrsCode>MAT123</CrsCode> <Semester>F1997</Semester>
      <ClassRoster Members="111111111 666666666"/>
    </Class>
  </Classes>
  <Courses>
    <Course CrsCode="CS308">  <CrsName>Market Analysis</CrsName> </Course>
    <Course CrsCode="MAT123"> <CrsName>Algebra</CrsName> </Course>
  </Courses>
</Report>
```

Write Lorel queries for the following:

(a) Find the number of courses taken by John Doe.

(b) Find the course code and course name of all courses taken by John Doe.

(c) Find the first and last names and StudId of students who have enrolled in MAT123.

4. Write a DTD for the following XML data:

```
<personals>
  <person id="H_MARUYAMA">
    <name><family>MARUYAMA</family> <given>Hiroshi</given></name>
    <email>maruyama@jp.ibm.com</email>
    <link subordinates="K_TAMURA"/>
  </person>

  <person id="N_URAMOTO">
    <name><family>URAMOTO</family> <given>Naohiko</given></name>
    <email>uramoto@jp.ibm.com</email>
    <link manager="mff"/>
  </person>

  <person id="K_TAMURA">
    <name>
      <family>TAMURA</family> <given>Kent</given>
    </name>
    <url href="mailto:kent@trl.ibm.co.jp"/>
    <url href="mailto:tkent@jp.ibm.com"/>
    <link manager="H_MARUYAMA"/>
  </person>

  <person id="mff">
    <name>
      <family>Fernandez</family> <given>mff</given>
    </name>
    <link subordinates="N_URAMOTO phil"/>
  </person>

  <person id="phil">
    <name>
      <family>Wadler</family> <given>Phil</given>
    </name>
    <link manager="mff"/>
  </person>

</personals>
```

5. Consider the following sample XML data:

```
<Transcripts>
  <Student>
    <StudId>111111111</StudId> <Name>John Doe</Name>
    <CrsTaken>
      <Course><Code>CS308</Code> <Sem>F1997</Sem> <Grade>B</Grade></Course>
      <Course><Code>MAT123</Code><Sem>F1997</Sem> <Grade>B</Grade></Course>
      <Course><Code>EE101</Code> <Sem>F1997</Sem> <Grade>A</Grade></Course>
      <Course><Code>CS305</Code> <Sem>F1995</Sem> <Grade>A</Grade></Course>
    </CrsTaken>
  </Student>
  <Student>
    <StudId>987654321</StudId> <Name>Bart Simpson</Name>
    <CrsTaken>
      <Course><Code>CS305</Code> <Sem>F1995</Sem> <Grade>C</Grade></Course>
      <Course><Code>CS308</Code> <Sem>F1994</Sem> <Grade>B</Grade></Course>
    </CrsTaken>
  </Student>
  <Student>
    <StudId>123454321</StudId> <Name>Joe Blow</Name>
    <CrsTaken>
      <Course><Code>CS315</Code> <Sem>S1997</Sem> <Grade>A</Grade></Course>
      <Course><Code>CS305</Code> <Sem>S1996</Sem> <Grade>B</Grade></Course>
      <Course><Code>MAT123</Code><Sem>S1996</Sem> <Grade>C</Grade></Course>
    </CrsTaken>
  </Student>
  <Student>
    <StudId>023456789</StudId> <Name>Homer Simpson</Name>
    <CrsTaken>
      <Course><Code>EE101</Code> <Sem>F1995</Sem> <Grade>B</Grade></Course>
      <Course><Code>CS305</Code> <Sem>S1996</Sem> <Grade>A</Grade></Course>
    </CrsTaken>
  </Student>
</Transcripts>
```

(a) Write an XSLT program that produces the HTML Code shown in the next page from the above XML document for student with id=111111111 (Your XSLT program should be generic enough that it should work with any other student id with minimal change).

(b) Write an XML-QL query to find the names of all students who have taken CS305.

(c) Write an XML-QL query to find the names of all students who have obtained a C grade.

```
<html>
<head><title>Transcript</title></head>
<body>
<b>John Doe (111111111)</b>
<table BORDER COLS=3 WIDTH="50%">
<tr>
<td><center>COURSE</center></td>
<td><center>SEMESTER</center></td>
<td><center>GRADE</center></td>
</tr>
<tr><td>CS308</td><td>F1997</td><td>B</td></tr>
<tr><td>MAT123</td><td>F1997</td><td>B</td></tr>
<tr><td>EE101</td><td>F1997</td><td>A</td></tr>
<tr><td>CS305</td><td>F1995</td><td>A</td></tr>
</table>
</body>
</html>
```