

Name:

Student ID Number:

Student in the Faculty of:

of the VUB/ULB

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**PLEASE ANSWER EACH QUESTION ON A SEPARATE PAGE**

**Question 1.** (5pt) Consider the XML document in Figure 1. It contains a small database of books in a library. Is this document syntactically correct? If not, identify and explain the syntactical errors.

```

<?xml version="1.0" encoding="utf-8"?>
<store>
  <genres>
    <genre name="Science Fiction">
      <genre name="Soft Science Fiction" name="Social Science Fiction" />
      <genre name="Space Opera"/>
      <genre name="Cyberpunk"/>
      <genre name="Military">
    </genre>
    <genre name="Historical" id=511>
      < genre name="Biography" />
      <genre name="Military"/>
    </genre>
  </genres>

  <book>
    <store:author>Edward Elmer Smith</store:author>
    <title>Triplanetary</title>
    <genre>Science Fiction <subgenre>Space Opera</genre></subgenre>
    <isbn>1-899884-12-2</isbn>
  </book>

  <book>
    <title>Nightfall
    <store:author>Isaac Asimov & Robert Silverberg</store:author>
    <genre>Science Fiction</genre>
    <isbn>978-0553290998</isbn>
  </book>

  <!-- N'est plus en stock.
  <book>
    <title>Neuromancer</title>
    <genre>Science Fiction <subgenre>Cyberpunk</subgenre></genre>
    <store:author>William Gibson</store:author>
    <isbn>0-441-56956-0</isbn>
    <characters>
      <character main_character="true">Henry Dorsett Case</character>
    </characters>
  </book>
  -->
</bookstore>

```

Figure 1: XML Document belonging to Question 1

**Question 2.** (3pt) Consider the XML document shown in Figure 2. To what namespace do the following elements belong?

1. The `p` elements.
2. The `circle` element.
3. The `math` element.

```
<?xml version="1.0" encoding="utf-8"?>
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:svg="http://www.w3.org/2000/svg">
  <body>
    <p>On peut déterminer la surface de</p>
    <!-- affiche un cercle -->
    <svg:svg width="300px" height="200px">
      <svg:circle cx="150" cy="100" r="50" fill="#ff0000"/>
    </svg:svg>
    <p>à l'aide de la formule
    <!-- affiche S = pi R^2 -->
    <math xmlns="http://www.w3.org/1998/Math/MathML">
      <mrow>
        <mi>S</mi>
        <mo>=</mo>
        <mi>pi</mi>
        <msup>
          <mi>R</mi><mn>2</mn>
        </msup>
      </mrow>
    </math>
    </p>
  </body>
</html>
```

Figure 2: XML Document belonging to Question 2

**Question 3.** (16 pt) Consider the XML document shown in Figure 3. It contains part of a database from a video rental website where users can upload new videos, rate videos, and complete their user profile. Write XPath expressions for the following queries:

1. Retrieve the titles of all videos uploaded by `ajenk@example.com`.
2. Retrieve the titles of all videos that have received a rating of 3 by `epwager@example.com`.
3. Retrieve all videos that were uploaded by a person who has not completed the “biographie” field of his user profile.
4. Retrieve the profiles of all users for which all uploaded videos have an average rating greater than or equal to 3.

**Question 4.** (4pt)

1. Explain what the XPath expression `//A[following-sibling::B is ../B]` does.
2. What is the result of following XPath expressions? Justify your answer.
  - $(1,2) \leq (3,4)$
  - $(1,2) = (2,3)$

```

<?xml version="1.0"?>
<smileyvideo>
  <video id="8628149">
    <uploader>satsuya.oda@example.com</uploader>
    <title>Bad Apple</title>
    <ratings>
      <rating user="epwager@example.com" value="3" />
      <rating user="ajenk@example.com" value="5" />
    </ratings>
  </video>

  <video id="123456">
    <uploader>ajenk@example.com</uploader>
    <title>Musician Cat</title>
    <ratings>
      <rating user="satsuya.oda@example.com" value="3" />
      <rating user="epwager@example.com" value="3" />
      <rating user="ajenk@example.com" value="4" />
    </ratings>
  </video>

  <video id="474920">
    <uploader>satsuya.oda@example.com</uploader>
    <title>Shrek</title>
    <ratings>
      <rating user="epwager@example.com" value="5" />
      <rating user="ajenk@example.com" value="3" />
    </ratings>
  </video>

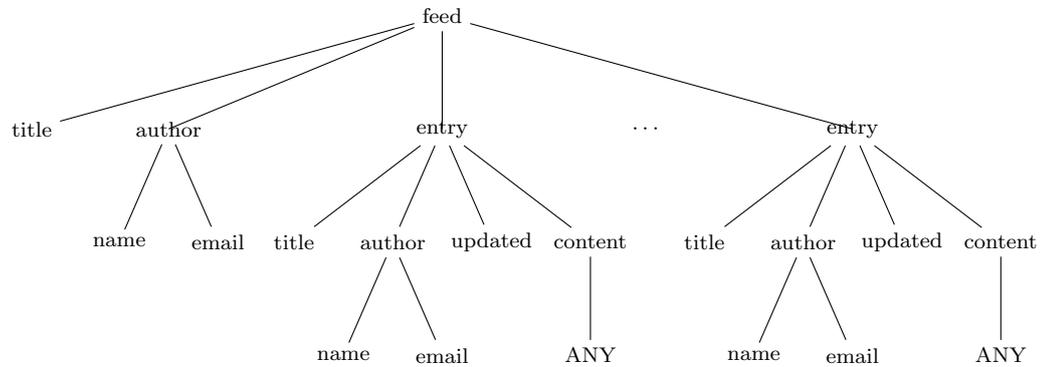
  <!-- Users List -->
  <user>
    <name>Emil P. Wager</name>
    <email>epwager@example.com</email>
  </user>
  <user>
    <name>Satsuya Oda</name>
    <email>satsuya.oda@example.com</email>
  </user>
  <user>
    <name>Anthony J. Jenkins</name>
    <email>ajenk@example.com</email>
    <bio>I am a food scientist, currently working in iceland. Make sure to
    check out my blog!</bio>
  </user>
</smileyvideo>

```

Figure 3: XML Document belonging to Question 3

**Question 5.** (10pt)

1. Does there exist a DTD that accepts only XML documents of the following form?



Here, we consider the **Email** nodes to be optional, and ANY denotes any XML tree composed of element names appearing in the above tree. Give such a DTD if it exists, or explain why it does not exist otherwise.

2. Explain the following XSD content model. What does it accept?

```
<xs:sequence>
  <xs:choice>
    <xs:element name="author" minOccurs="1" maxOccurs="5"/>
    <xs:sequence>
      <xs:element name="editor" minOccurs="1" maxOccurs="3" />
      <xs:element name="author" minOccurs="1" maxOccurs="10"/>
    </xs:sequence>
  </xs:choice>
  <xs:element name="publisher" minOccurs="0" maxOccurs="1"/>
</xs:sequence>
```

**Question 6.** (10pt) Construct the XML document produced by applying the XSLT stylesheet from Figure 5 to the XML document in Figure 4.

```
<news>
<article category="culture">
  <source>tuner.be</source>
  <title>Marc Ysaye reçoit le Grand Prix des Radios francophones
    publiques</title>
  <content>
    Décerné par un jury composé de spécialistes musicaux et de journalistes de
    presse écrite, le Grand Prix des Radios Francophones Publiques 2010 a été
    attribué, le 10 juin, à deux émissions. Le premier des prix est pour un
    reportage de la catégorie long format, et qui va à "Jamaïque, dans l'oeil
    de Bob Marley" de <person occupation="reporter">Gérard Suter</person> et
    <person occupation="reporter">Arnaud Robert</person>. Une série de
    reportages diffusée sur La 1ère, la station info-talk de la Radio Suisse
    Romande. L'autre récompense, pour un format court, revient à " Blackbird "
    de <person occupation="reporter">Marc Ysaye</person> et <person
    occupation="reporter">Laurent Rieppi</person>. C'est une séquence sur les
    Beatles diffusée sur les ondes de Classic 21 dans l'émission " Easy Rider ".
  </content>
</article>
<article category="technologies">
  <source>RIA Novosti</source>
  <title>Une mission martienne simulée de 520 jours débute en Russie</title>
  <content>
    Une mission martienne simulée de 520 jours a débuté jeudi à l'Institut des
    problèmes médico-biologiques de Moscou. L'équipage international comprend
    six volontaires dont trois Russes - <person>Alexeï Sitev</person>
    (commandant de la mission), <person occupation="medic">Soukhrob
    Kamolov</person> (médecin) et <person occupation="researcher">Alexandre
    Smoleevski</person> (chercheur), et un <person
    occupation="researcher">Chinois Wang Yue</person> (chercheur).
  </content>
</article>
<article category="technologies">
  <source>AFP</source>
  <title>Japon: deux nouveaux robots montrent leur nez, un enfant de
    5 ans et un bébé</title>
  <content>
    Des chercheurs japonais ont présenté vendredi deux nouvelles créatures
    robotiques, un enfant de 5 ans et un bébé, modèles destinés à étudier puis
    reproduire l'acquisition des connaissances et capacités physiques humaines,
    pour permettre aux robots de vivre avec les hommes. Le professeur <person
    occupation="researcher">Minoru Asada</person>, leader de l'équipe de
    recherche ayant réalisé les deux robots, pense qu'une manière de réaliser
    des robots intelligents est de leur faire apprendre de manière similaire aux
    êtres humains.
  </content>
</article>
</news>
```

Figure 4: XML Document belonging to Question 6

```

<?xml version="1.0"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
  <xsl:template match="/">
    <ScientistsInNews>
      <xsl:apply-templates select="//person[not(preceding::person = .)]" />
    </ScientistsInNews>
  </xsl:template>

  <xsl:template match="person" />

  <xsl:template match="person[@occupation='researcher']">
    <xsl:variable name="name" select="./text()" />
    <xsl:variable name="references"
      select="//person[. eq $name]/../parent::article" />

    <Person>
      <xsl:attribute name="name"><xsl:value-of select="$name"/></xsl:attribute>
      <Peers>
        <xsl:for-each select="$references/content/person[. != $name]">
          <xsl:sort select="./text()" />

          <xsl:choose>
            <xsl:when test="./@occupation = 'researcher'">
              <Scientist name="{./text()}" />
            </xsl:when>
            <xsl:otherwise>
              <Peer name="{./text()}" />
            </xsl:otherwise>
          </xsl:choose>
        </xsl:for-each>
      </Peers>
    </Person>
  </xsl:template>
</xsl:stylesheet>

```

Figure 5: XSLT Stylesheet belonging to Question 6.

**Question 7.** (5pt) Construct a SPARQL query that retrieves all countries having a population of 15 million inhabitants or more. We assume that countries have the type `Country`; that the property `populationCensus` gives the population size; and that the name of a country is given by the RDFS label property, as exemplified by the following RDF excerpt.

@prefix	dbpedia-owl:	<http://dbpedia.org/ontology/> .
@prefix	dbpprop:	<http://dbpedia.org/property/> .
@prefix	rdfs:	<http://www.w3.org/2000/01/rdf-schema#> .
dbpedia:Belgium	rdfs:type	dbpedia-owl:country ;
	dbpprop:populationcensus	"10296350"^^xsd:int ;
	rdfs:label	"Belgium" .
dbpedia:Japan	rdfs:type	dbpedia-owl:country ;
	dbpprop:populationcensus	"127333002"^^xsd:int ;
	rdfs:label	"Japan" .
...		