1. Information Sets

Build an information set tree of the following XML documents.

You can provide only the following set of properties: (parent/children connection, attributes and namespaces)

```xml
<?xml version="1.0"?>
<catalog>
   <!-- Start book list to be defined -->
   <Book id='bk101'>
      <author>Gambardella, Matthew</author>
      <title>XML Developer's Guide</title>
      <genre>Computer</genre>
      <price>44.95</price>
      <publish_date version='hard' version2='soft'>2000-10-01</publish_date>
   </Book>
</catalog>

<?xml version="1.0"?>
<!DOCTYPE eth>
   <date>13.11.2006</date>
   <president number="1">Empty</president>
   <xmldb:Rektor>Name 2</xmldb:Rektor>
</eth>
```

2. XDM: XPath and XQuery Data Model

2.1. Name several differences between XDM and Information Sets

2.2. Which of the following XDM sequences are equivalent:

1. (1, 2, 3, 4, 5, <a/> , <foo><bar/></foo>)
2. (1, (2, 3), 4, (5, <a/>, <foo><bar/></foo>))
3. (1, <foo><bar/></foo>, 2, 3, 4, 5, <a/>)
4. (<a/>)
5. <a/>
6. ()
7. (1, 1, 1)
8. ((),(),())
9. (1)

3. Data types (from XML Schema and XML)

Create a one-to-one mapping between the following set of XDM sequences. Use each XDM sequence and XML schema type (with cardinality) only once:

(1, 2, 3, 4, 5)
(<foo/>, <foo/>)
(“foo”, “bar”)  
(“foo”)  
()
and the following set of XML schema types and cardinalities:

```xml
xs:integer+
xs:integer*
xs:string?
xs:string*
xs:element()+
```

### 4. DTD validation

1. Does DTD support documents that have namespaces?
2. Does DTD has a type system?
3. What is the difference between CDATA and PCDATA?
4. Is the following XML document valid under the given DTD. If not modify the document so that it is a valid document. Also modify the DTD so that it validates the original document.

```xml
<?xml version="1.0"?>
<!DOCTYPE catalog SYSTEM "catalog.dtd">
<catalog>
  <!-- Start book list to be defined -->
  <Book id='101'>
    <author>Gambardella, Matthew</author>
    <title>XML Developer's Guide</title>
    <genre>Computer</genre>
    <price>44.95</price>
    <publish_date version='hard' version2='soft'>2000-10-01</publish_date>
  </Book>
</catalog>
```

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!ELEMENT catalog (Book+)>
<!ELEMENT Book (title, author, price, publish_date, publisher)>
<!ATTLIST Book id ID #REQUIRED>
<!ELEMENT author (#PCDATA)>
<!ELEMENT title (#PCDATA)>
<!ATTLIST title lang CDATA 'en'>
<!ELEMENT price (#PCDATA)>
<!ATTLIST price currency CDATA #REQUIRED>
<!ELEMENT publish_date (#PCDATA)>
<!ELEMENT publisher (#PCDATA)>
<!ATTLIST publish_date version CDATA #IMPLIED>
```

### 5. XML Schema

Create a possible XML schema which validates the following document
<xml version="1.0" encoding="UTF-8"?>
<movies xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="solution.xsd">
    <Movie id="y56225">
        <title>Love Story</title>
        <year>1980</year>
        <director name="Coppola"/>
        <comment lang=""/>
        <newcomment>Oscar</newcomment>
        <comment lang=""">1980 Warner Bros.</comment>
        <!-- Famous movie of the 80s -->
    </Movie>
</movies>

6. Document Validation

Connect each document type with the type of schema that can be used to validate it.

<table>
<thead>
<tr>
<th>Document Type</th>
<th>Schema Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>XML</td>
<td>XML Schema</td>
</tr>
<tr>
<td>JSON</td>
<td>DTD</td>
</tr>
<tr>
<td>Protocol buffers</td>
<td>Schematron</td>
</tr>
<tr>
<td>XHTML</td>
<td>RelaxNG</td>
</tr>
<tr>
<td></td>
<td>JSON Schema</td>
</tr>
<tr>
<td></td>
<td>JSound</td>
</tr>
<tr>
<td></td>
<td>Kwalify</td>
</tr>
<tr>
<td></td>
<td>The XML Schema for XHTML documents</td>
</tr>
<tr>
<td></td>
<td>proto3</td>
</tr>
<tr>
<td></td>
<td>No schema at all</td>
</tr>
</tbody>
</table>