Answer to Question 1

```xml
<? Xml version = "1.0" encoding = "utf-8" standalone = "yes" ?>
<AuthorBookData>
        <author authorId = "cf" writing = "sw">
                <name> Carrie Fisher </name>
                <address>
                        <street>Maple</street> <city>H'wood</city>
                </address>
                <address>
                        <street>Locust</street> <city>Malibu</city>
                </address>
        </author>
        <author authorId = "mh" writing = "sw">
                <name>Mark Hamill</name>
                <address>
                        <street>Oak</street> <city> B'wood</city>
                </address>
        </author>
        <book bookId = "sw" authorOf = "cf", "mh">
                <title>Star War</title>
                <publisher>The MIT Press</publisher> <year>1977</year>
        </book>
</AuthorBookData>
```

Answer to Question 2

```xml
<? Xml version = "1.0" encoding = "utf-8" standalone = "no" ?>
<!DOCTYPE AuthorBook SYSTEM "AuthorBook.dtd">
<AuthorBook>
          <Author AuthorId = "sf" writing = "gg">
                    <Name>F. Scott Fitzgerald</Name>
                    <Address>
                                   <Street>123 Maple St.</Street><City>Hollywood</City>
                    </Address>
                    <Address>
                                   <Street>5 Locust Ln.</Street><City>Malibu</City>
                    </Address>
          </Author>
          <Author AuthorId = "hl" writing = "km">
                    <Name>Harper Lee</Name>
                    <Address>
                                   <Street>456 Oak Rd.</Street><City>Brentwood</City>
                    </Address>
          </Author>
          <Book BookId = "km" authorOf = "hl">
                    <Title>To Kill a Mockingbird</Title>
                    <Year>1960</Year>
                    <Publisher>J. B. Lippincott & Co.</Publisher>
          </Book>
          <Book BookId = "gg" authorOf = "sf">
                    <Title>The Great Gatsby</Title>
                    <Year>1925</Year>
                    <Publisher>Charles Scribner's Sons</Publisher>
          </Book>
</AuthorBook>
```

Answer to Question 3

```xml
<? Xml version = "1.0" encoding = "utf-8" ?>
<xs: schema xmlns: xs = "http://www.w3.org/2001/XMLSchema">
   <xs: complexType name = "authorType">
      <xs: sequence>
         <xs: attribute name = "AuthorId" type = "xs: string" />
         <xs: attribute name = "Writing" type = "xs: string" />
      </xs: sequence>
   </xs: complexType>
   <xs: complexType name = "bookType">
      <xs: sequence>
         <xs: attribute name = "BookId" type = "xs: string" />
         <xs: attribute name = "authorOf" type = "xs: string" />
      </xs: sequence>
   </xs: complexType>
   <xs: complexType name = "addressType">
      <xs: sequence>
         <xs: element name = "street" type = "xs: string" />
         <xs: element name = "city" type = "xs: string" />
      </xs: sequence>
   </xs: complexType>
      <xs: element name = "AuthorBook">
         <xs: complexType>
            <xs: sequence>
               <xs: element name = "Author" type = "authorType" minOccurs = "0" maxOccurs = "unbounded" />
                  <xs: complexType>
                     <xs: sequence>
                        <xs: element name = "Name" type = "string" />
                        <xs: element name = "Address" type = "addressType" minOccurs = "1" maxOccurs = "unbounded" />
                     </xs: sequence>
                  </xs: complexType>
```

```
                <xs: element name = "Book" type = "bookType"  minOccurs = "0" maxOccurs = "unbounded" />
            <xs: complexType>
               <xs: sequence>
                  <xs: element name = "title" type = "xs: string"/>
                  <xs: element name = "Publisher" type = "xs: string"/>
                  <xs: element name = "year" type = "xs: string" />
               </xs: sequence>
            </xs: complexType>
         </xs: sequence>
      </xs: complexType>
   </xs: element>
</xs: schema>
```

4.

ALGORITHM *genTree*(*X*)(**X* - an XPath expression. *)

Create a path *P* for the main path in *X*. On *P*, each node corresponds to an element in *X*, but not in any predicate;

Let $e_1, ..., e_m$ be all the elements on *P*;

for i = 1 to m **do** {

    if e_i is associated with a predicate: $[x_{i1}=a_1 \wedge ... \wedge x_{ir}=a_r]$

    then { **for** j = 1 to r **do** {

        $T_i \leftarrow$ *genTree*(x_{ij});

        make the root of T_i a child of e_i;

        make a_j the leaf node of the main path in T_i;

        }

        }

    }

*Note that in "/Purchase[Seller[Location='Houston']]/Buyer[Location = 'Winnipeg']" the main path is "/Purchase/Buyer".

5.

a)   Let $s = doc(book.xml)
        for $book in $s/AuthorBook/Book/,
            $title in $book/Title
        where $book/@authorOf = "D. Knuth"
        return $title

b)   Let $s = doc(book.xml)
        For $book in $s/AuthorBook/Book,
        where $book/publisher = "Addison" and $book/year = "2007"
        return $book/Title

6.
/authorBook/author/ [/@AuthorId = ../book/@authorOf
and ../book/Title = "Art of Programming"
and ../book/year = "2007"]/name