1. (a) (8 points) Of the following statements, identify all that hold about XML keys:
   A. A keyref implies that the selected tuples are unique but only for the fields specified
   B. A keyref indicates that each selected tuple of a selected element corresponds to an element in the referenced key
   C. The unique element has been deprecated and replaced by the key element
   D. A key allows more than one field
   
   Solution: B and D −2 per wrongly checked or wrongly unchecked choice

   (b) (8 points) Of the following statements, identify all that hold about the data-centric view of XML
   A. The data-centric view works best when dealing with settings where documents have a regular structure
   B. The data-centric view gives prominence to XML documents as repositories of corporate knowledge
   C. The data-centric view reduces but may not fully eliminate the need for storing large data objects such as CLOBs
   D. The data-centric view requires that XML documents be shared through databases: thus there is no need for separate messaging
   
   Solution: A and C −2 per wrongly checked or wrongly unchecked choice

   (c) (8 points) Of the following statements, identify all that hold about the XPath syntax allowed in key selectors
   A. It is possible to construct an expression referring to a grandchild element of the given element
   B. If the schema states that a specific grandchild element of the given element may contain only text, it is possible to construct an expression referring to the text occurring within that grandchild element
   C. It is possible to construct an expression referring to the first grandchild element of the given element
   D. ../child is allowed, where child is a particular child element and exists in the appropriate context
   
   Solution: A and B −2 per wrongly checked or wrongly unchecked choice

   (d) (6 points) List three possible interpretations of “null” values (in about 25 words total).

   Solution:
   - Not applicable
   - Unknown: missing
   - Questionable existence
   - Absent (known but absent)

Listing 1: Unique songs nested in unique singers with no attributes

```
<SongList>
  <listTitle>Classics</listTitle>
  <Sgr name="Eagles">
    <Song genre="rock" lg="en">Hotel California</Song>
  </Sgr>
</SongList>
```
2. (20 points) Consider the XML schema underlying Listing 1 to a relational schema. Assume that SongList have unique listTitles, Sgrs have unique names within SongList, and within a Sgr, song titles (expressed as text fields) are unique.

Of the following statements, identify all that are true about mapping the above-mentioned XML schema to a relational schema using the generalized TGE approach:

A. Create a table SongList whose key is listTitle
B. Create a table SongList with no columns
C. Create a table Sgr with one column name, which is also its key
D. Create a table Sgr with two columns name and listTitle; name is its key and listTitle is a foreign key to the SongList table
E. The Song table has at least the columns genre and lg for the corresponding XML attributes
F. The Song table has a column for the text
G. The Song table has both the following foreign keys: name in Sgr and listTitle in SongList
H. The key of the Song table is a composite of name and listTitle
I. There is no need for a separate table for listTitle because it is promoted to help uniquify its parent, SongList
J. Many rows of the Sgr table may have the same name, but each such row would correspond to a different song title in Song

Solution: A, E, F, G, I

D is false because the Sgr’s key should be a composite of name and listTitle
H is false because Song’s key should also include its title text
J is false because the songs may be repeated in different song lists

More on the solution itself:

- listTitle is promoted to uniquify SongList
- SongList(listTitle); key is listTitle
- Sgr(name, listTitle); key is (name, listTitle); foreign key on listTitle
- Song(name, listTitle, genre, lg, title-text); key is (name, listTitle, title-text); foreign keys on listTitle and name