

**University of Cape Town**  
**Department of Computer Science**  
**CSC3003s Class Test 1 [Retest]**  
**2006**

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**Marks** : 35

**Time** : 45 minutes

**Instructions:**

- Answer all questions.
  - Show all calculations where applicable.
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**Question 1: Core XML [10]**

- a) What two characteristics must a well-formed XML document have? Give examples of non-well-formed documents violating each of these characteristics. [4]
- b) What characteristic must a valid XML document have? [1]
- c) When is it necessary to use an entity for the quotation mark character? Why is it otherwise not always necessary? [2]
- d) Convert the following to use only default namespaces. [3]

```
<uct:uct xmlns:uct="http://ns1" xmlns:dc2="http://ns3">
  <dc1:title xmlns:dc1="http://ns2">data1</dc1:title>
  <dc2:title>data2</dc2:title>
</uct:uct>
```

**Question 2: XML Languages [15]**

- a) Suppose the following DOM statement returns the value 'james'. Write a sample XML document that will result in this return value. Write an XPath expression that is equivalent. Hint: Remember that **item** is zero-based. [3]
- documentElement → getElementsByTagName ('book') → item(0) → getElementsByTagName ('author') → item(1) → getElementsByTagName ('name') → item(2) → firstChild → data
- b) Answer the following questions based on this piece of XML:

```
<furniture xmlns="http://ns1">
  <room name="lounge">
    <piece>couch</piece>
    <piece>coffee table</piece>
    <piece>side table</piece>
  </room>
</furniture>
```

Assume that **room** is infinitely repeatable and at least one **room** is required and at least one **piece** is required in every **room**, but at most 12 **pieces** can appear in a single room.

- i. What does the XPath expression `//room[1]/piece[2]` return? [1]
- ii. Write an XML Schema complexType type definition **furnitureType** corresponding to the content of the **furniture** element and its descendents. [4]
- iii. Write an XSLT template, using the stylesheet outline provided, to convert the **furniture** node into the following structure. [5]

```
<lounge xmlns="http://ns2">
  <furniture piece="couch"/>
  <furniture piece="coffee table"/>
  <furniture piece="side table"/>
  <furniture piece="item in every room"/>
</lounge>
```

Assume your template will be placed within the following stylesheet:

```
<xsl:stylesheet version="1.0"
  xmlns:xsl=http://www.w3.org/1999/XSL/Transform
  xmlns:source=http://ns1
  xmlns:target="http://ns2">
  ...
</xsl:stylesheet>
```

- c) Explain how XSLT is used with FO to create documents in arbitrary non-XML formats from arbitrary XML data. [2]

### Question 3: Database Systems [10]

- a) Name any 2 components of a typical Database Management System (DBMS), and explain briefly what their role/function is within the DBMS. [4]
- b) Consider the schema below, which comes from a video store database:

CLIENT ( ID, Name, Telno)	// client ID, name and telephone number
VIDEO ( Num, Title, Year, Length )	//video no., film title, year made, duration
RENTAL ( ID, Num, Day )	// client ID, video no., date taken out
STARS ( Num, Actor )	// video no. actor/actress name

Give SQL statements for **ANY THREE (3)** of the following queries:

- i. Give the title of all videos that were made before the year 2000, along with the ID of clients who rented them, in alphabetical order of video title.
- ii. Give the ID of all videos that do not have any actors (i.e. that do not appear in the STARS relation).
- iii. For each actor, give the actor name along with the number of “longs films” they have starred in. A “long film” is one that is longer than 120 minutes duration.
- iv. Give the titles of all videos that are longer than average duration (e.g. if the average length of video in the VIDEO relation is say 95 minutes, then give the titles of all videos longer than 95 minutes duration).

[6]