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THE HONG KONG POLYTECHNIC UNIVERSITY

DEPARTMENT OF COMPUTING

EXAMINATION

Course : MSc Scheme - 61030

Subject : COMP5323 Web Database Technologies and Applications

Group : 201, 202, 205, 2888

Session : 2010 / 2011 Semester II

Date : 23 May 2011 Time : 18:30-20:30

Time Allowed: 2 Hours Subject Lecturer: Vincent Ng

This question paper has ___5___ pages (cover & attachment included).

Instructions to Candidates:

1. This is an open book examination.
2. Students should attempt ALL questions.
3. Marks for each question are shown next to the question. Total marks = 100.

Do not turn this page until you are told to do so!

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Question 1 *[Total = 25 marks]*

(a) Draw a DOM tree for the XML file shown in Figure 1. (4 marks)

(b) For the XML file shown in Figure 1, write XQuery expressions to satisfy the queries below. If a query cannot be answered, provide justification. (4 marks each)

i. Provide names of the laboratories which have been formed before 2008.
ii. Find the laboratories which have no director or more than one director.
iii. Provide the names of laboratories for which they have projects of their own.
iv. Provide the names of laboratories for which they have projects but no laboratory director.

(c) Provide a DTD for the XML file in Figure 1. (5 marks)

Question 2 *[Total = 25 marks]*

(a) Provide an XML schema for the XML file in Figure 1 with additional requirements listed below. (12 marks)

- The year of a laboratory formed should be in between 2001-2010.
- In each department, there are no more than 5 laboratories.

(b) The 'loc' elements have the room number information. However, there is a need to support locations outside campus. In addition to existing information, a location outside campus would include a building name. Modify the answer in (a) to further support the extensions of the loc element. (6 marks)

(c) Suggest a modification of the schema file of the answer in (a) so as to define a key for the laboratory element and a keyref for the JointLab element. The key should be a compound key of laboratory ID and room number. (7 marks)

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Question 3 *[Total = 25 marks]*

(a) What are the possible steps in using the BUS indexing method for the processing of the XPath expression /courses//required/book/title[./='web']? (5 marks)

(b) What is the purpose of the accumulator used in the BUS indexing method? (2 marks)

(c) Label the nodes of the DOM tree of the XML file in Figure 2 with the indexing scheme of OrdPath. An attribute of an element is considered as the leftmost child node of it. (6 marks)

(d) What is the node number of a new laboratory director after adding it to the laboratory with Id 004 before John Doe in the answer of (c)? (3 marks)

(e) Use the DOM tree in (c) to illustrate the potential data value conflict of between 2 transactions in concurrency control. (4 marks)

(f) Illustrate how the IX, IS, S and X locks can be used to avoid conflict for an update transaction of a roomNo element by using the DOM tree in (c). (5 marks)

```
<?xml version="1.0" encoding="UTF-8"?>
<Faculty>
<Department deptId="CS">
        <Lab>
            <LabName LabId="001">Internet</LabName>
            <loc><roomNo>PQ111</roomNo></loc>
            <YearFormed>2002</YearFormed>
            <LabDir>Peter Jones</LabDir>
        </Lab>
        <Lab>
            < LabName LabId="004">Chinese</LabName>
            <loc><roomno>QT102</roomNo></loc>
            <YearFormed>2010</YearFormed>
            <LabDir>N. Owen</LabDir>
            <LabDir>John Doe</LabDir>
        </Lab>
</Department>
<Department deptId="CE">
        <Lab>
            < LabName LabId="002">Photonics</LabName>
            <loc><roomNo>BC607</roomNo></loc>
            <YearFormed>2004</YearFormed>
            <LabDir>John Doe</LabDir>
        </Lab>
</Department>
<Projects>
<Project> <JointLab JId = "008"/> </Project>
</Projects>
</Faculty>
```

Figure 2.

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Question 4 ***[Total = 25 marks]***

(a) Provide the structural summary of the XML file shown in Figure 2 when the XQueC method is applied. (5 marks)

(b) Provide the Xpath expressions of the containers of the XML file shown in Figure 2. For each container, show its contents. (5 marks)

(c) The XParent method is used to store the XML data shown in Figure 2. Show the contents of the LabelPath and DataPath tables after adopting the method. (8 marks)

(d) Provide a SQL expression for the XPath expression as '/Faculty/Department/Lab[./YearFormed=2010]/LabDir' when Xparent is used to store the data in Figure 2. (7 marks)

***** end*****

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```
<?xml version="1.0" encoding="UTF-8"?>
<Faculty>
<Department deptId="CS">
        <Lab>
            <LabName LabId="001">Internet</LabName>
            <loc><roomNo>PQ111</roomNo></loc>
            <YearFormed>2002</YearFormed>
            <LabDir>Peter Jones</LabDir>
        </Lab>
        <Lab>
            < LabName LabId="004">Chinese</LabName>
            <loc><roomno>QT102</roomNo></loc>
            <YearFormed>2010</YearFormed>
            <LabDir>N. Owen</LabDir>
            <LabDir>John Doe</LabDir>
        </Lab>
</Department>
<Department deptId="CE">
        <Lab>
            < LabName LabId="002">Photonics</LabName>
            <loc><roomNo>BC607</roomNo></loc>
            <YearFormed>2004</YearFormed>
            <LabDir>John Doe</LabDir>
        </Lab>
        <Lab>
            <LabName LabId="006">Electronics</LabName>
            <loc><roomNo>QT103</roomNo></loc>
            <YearFormed>2002</YearFormed>
            <LabDir>John Doe, Jr</LabDir>
        </Lab>
        <Lab>
            < LabName LabId="008">Telecommunications</LabName>
            <loc><roomNo>BC706</roomNo></loc>
            <YearFormed>2004</YearFormed>
        </Lab>
</Department>
<Projects>
<Project> <JointLab JId = "001"/> <JointLab JId="008"/> </Project>
<Project> <JointLab JId = "001"/> <JointLab JId="002"/> <JointLab JId="004"/>
</Project>
<Project> <JointLab JId = "008"/> </Project>
</Projects>
</Faculty>
```

Figure 1.