

# COP5725 Database Management Systems

## Final – Fall 2005

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January 4, 2006

Name:	
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Email:	

- This is a 120 minute, closed-book exam. You are allowed to use handwritten notes on both sides of a US letter size sheet of paper.
- This exam contains 8 single-sided sheets of paper (including this one)
- Write all answers on these pages, preferably on the white space in the problem statement. Continue on the back page if running out of space but **clearly number** your answers if doing so.
- Make sure you attack every problem; partial credit will be awarded for incomplete or partially correct results.

Grading:

1		25
2		25
3		15
4		10
5		10
6		15
Total		100





d. [5] Find the company that has the most employees.

e. [5] Find those companies whose employees earn a higher salary, on average, than the average salary at *First Bank Corporation*.

### 3. XML [15]

Consider the following XML document:

```
<? xml version='1.0' ... >
<BOOKLIST>
  <BOOK GENRE='Science' FORMAT='Hardcover'>
    <AUTHOR>
      <FIRSTNAME>Richard</FIRSTNAME>
      <LASTNAME>Feynman</LASTNAME>
    </AUTHOR>
    <TITLE>The Character of Physical Law</TITLE>
    <PUBLISHED>1980</PUBLISHED>
  </BOOK>
  <BOOK GENRE='Fiction'>
    <AUTHOR>
      <FIRSTNAME>R.K.</FIRSTNAME>
      <LASTNAME>Narayan</LASTNAME>
    </AUTHOR>
    <TITLE>Waiting for the Mahatma</TITLE>
    <PUBLISHED>1981</PUBLISHED>
  </BOOK>
  <BOOK GENRE='Fiction'>
    <AUTHOR>
      <FIRSTNAME>R.K.</FIRSTNAME>
      <LASTNAME>Narayan</LASTNAME>
    </AUTHOR>
    <TITLE>The English Teacher</TITLE>
    <PUBLISHED>1980</PUBLISHED>
  </BOOK>
</BOOKLIST>
```

Answer the following questions:

- a. [5] Give a DTD of this document so that the above document is correct but the DTD is as constrained as possible.

b. [5] Give a XPath expression that selects all authors from this document (no need to eliminate duplicates).

c. [5] What is the result of the execution of the following XQuery query?

```
FOR $p IN //BOOK
LET $q := $p/AUTHOR
LET $r := $p/PUBLISHED
LET $t := $p/@GENRE
RETURN
  <PUBLICATION>
    <AUTHORNAME> {$q/FIRSTNAME} {$q/LASTNAME} </AUTHORNAME>
    {$r}
    <GENRE>{$t}</GENRE>
  </PUBLICATION>
```

#### 4. Transactions [10]

Consider the following two transactions:

```
T1: READ(A,t); t:=t+2; WRITE(A,t); READ(B,t); t:=t*3; WRITE(B,t);
T2: READ(B,s); s:=s*2; WRITE(B,s); READ(A,s); s:=s+3; WRITE(A,s);
```

where  $READ(A,t)$  means read element  $A$  into local variable  $t$  and  $WRITE(A,t)$  is similarly defined.

With respect to modification of the database elements  $A,B$ , answer the following questions:

a. [5] Pick values for  $t,s$  and an ordering of the execution of the operations in the two transactions to show that the result could be different than a *serial* execution of the transactions (remember that there are two possible serial executions,  $T1,T2$  and  $T2,T1$ ).



- b. [3] Why are *functional dependencies* important? Why should they be preserved?
- c. [3] Why database systems have their own security and access control mechanisms (as opposed to using the operating systems mechanisms).
- d. [3] Explain the differences, from a database perspective, between *Object-Relational* and *Object Oriented*.
- e. [3] Why is concurrency control important?