PAPER CODE NO.	EXAMINER : Dr V. Tamma
COMP302	DEPARTMENT : Computer Science Tel. No. 46797

THE UNIVERSITY
of LIVERPOOL

JANUARY 2006 EXAMINATIONS

Bachelor of Arts : Year 3
Bachelor of Engineering : Year 3
Bachelor of Science : Year 2
Bachelor of Science : Year 3
Master of Engineering : Year 4
No qualification aimed for : Year 1

Advanced Database Technology

TIME ALLOWED : 2.5 hours

INSTRUCTIONS TO CANDIDATES

Attempt all questions in Section A.
Attempt **TWO** questions from Section B only.

If you attempt to answer more questions than the required number of questions (in any section), the marks awarded for the excess questions will be discarded (starting with your lowest mark).

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SECTION A

Attempt ALL questions from this section. Section A is worth 50 marks

1. Explain the concepts of serial, non-serial, and serializable schedules. State the rules for determining the importance of read and write operations. **(10 marks)**

2. A DDBMS must ensure that no two sites create a database object with the same name. One solution to this problem is to create a central name server. What are the disadvantages with this approach? Propose an alternative approach that overcomes these disadvantages and illustrate it with an example. **(10 marks)**

3. Discuss the main strategies that can be used to create persistent objects within an OODBMS. **(10 marks)**

4. What are the advantages and disadvantages of extending the relational data model by means of ORDBMS? **(10 marks)**

5. Discuss how XML can be transferred into a database. **(10 marks)**

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SECTION B

Attempt TWO questions from this section. Each question is worth 25 marks. Credit will be given for the best 2 answers only.

1. (a) Discuss the following advanced transaction models, in particular in terms of conformity to the ACID properties, recovery features offered, and advantages:

   i. nested transactions,

   ii. sagas,

   iii. multi-level transactions,

   iv. dynamically restructuring transactions.

   (15 marks)

   (b) Consider the schedule given below. Determine if this schedule is conflict serializable, and divide the transactions in the schedule into subtransactions that can be executed concurrently while generating the correct result. **(10 marks)**

Time	T1	T2
t1	begin-transaction	
t2	read(**bal**(**x**))	
t3	(**bal**(**x**)) = (**bal**(**x**)) - 100	
t4	write(**bal**(**x**))	
t5		begin-transaction
t6		read(**bal**(**y**))
t7		(**bal**(**y**)) = (**bal**(**y**)) - 80
t8		write(**bal**(**y**))
t9	read(**bal**(**x**))	
t10	(**bal**(**x**)) = (**bal**(**x**)) + 50	
t11	write(**bal**(**x**))	
t12	commit	
t13		read(**bal**(**y**))
t14		(**bal**(**y**)) = (**bal**(**y**)) + 150
t15		write(**bal**(**y**))
t16		commit

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2. Create a graphical representation of the XML Query Data Model for the XML Schema below. **(25 marks)**

```
<?xml version="1.0"?>
<xsd:schema xmlns:xsd = "http://www.w3.org/2001/XMLSchema"
            targetNamespace = "http://www.dreamhouse.co.uk/staff">
<xsd:import namespace = "http://www.w3.org/XML/1998/namespace"
            schemaLocation = "http://www.w3.org/2001/xml.xsd/">
    <xsd:element name = "STAFF" type = "StaffType>
        <xsd:complexType name = StaffType">
            <xsd: element name = "STAFFNO" type = "xsd:string"/>
            <xsd: element name = "SALARY" type = "xsd:decimal"/>
            <xsd: element name = "branchNo" type = "xsd:string"/>
        </xsd:complexType>
    </xsd:element>
</xsd:schema>
```

3. (a) Discuss the concept of deadlock and illustrate the discussion with an example. **(10 marks)**

   (b) The locking information for several transactions is shown in the table below. Produce a wait-for-graph (WFG) for the transactions and determine whether deadlock exists. **(15 marks)**

Transaction	Data items locked by transaction	Data items transaction is waiting for
T1	x2	x1, x3
T2	x3,x10	x7, x8
T3	x8	x4, x5
T4	x7	x1
T5	x1, x5	x3
T6	x4, x9	x6
T7	x6	x5