



Reg. No. : .....

Name : .....

**First Semester M.Tech. Degree Examination, March 2014**  
**(2013 Scheme)**  
**Computer Science and Engineering/Information Security**  
**RCC1002 : TOPICS IN DATABASE TECHNOLOGY**

Time : 3 Hours

Max. Marks : 60

Answer **any two full** questions from **each** Module.

**Module – 1**

1. a) Illustrate conflict serializability with the help of an example. 2  
b) Consider the following transactions : 3

T1 :     read (A)  
          read (B)  
          if (A = 0) then B + 1  
          write (B)

T2 :     read (B);  
          read (A);  
          if (B = 0) then A + 1  
          write (A)

The consistency requirement is that A or B or both are equal to zero. Assume that both A and B are initially zero. Show a concurrent execution of T1 and T2 that produces a non-serializable schedule.

- c) Consider the following schedule where X, Y and Z are data items.  $R_i(X)$  (respectively,  $W_i(X)$ ) means Transaction  $T_i$  reads (respectively, writes) data item X.  $C_i$  means transaction  $T_i$  commits. 3

$R_1(X) ; R_2(Z) ; R_1(Z) ; R_3(X) ; R_3(Y) ; W_1(X) ; W_3(Y) ; R_2(Y) ; W_2(Z) ;$   
 $W_2(Y) ; C_1 ; C_2 ; C_3$

Determine whether the transaction is strict, cascade-less, recoverable and/or non-recoverable. Justify your answer.

- d) What is meant by write-ahead logging ? What is its significance ? 2

P.T.O.



2. a) Consider a file with 1024 blocks. Suppose that there are 4 buffers available to perform external sorting. Compute the following
- i) the number of initial runs
  - ii) degree of merging
  - iii) number of passes in the merge phase. 2

- b) Consider a relational database with the following related tables : 6

SUPPLIER (SNO, SNAME, SADDR, SPHONE)

CUSTOMER(CNO, CNAME, CADDR, CPHONE)

ITEM(ITEMCODE, NAME)

CONSIGNMENT(SNO, CNO, ITEMCODE, QUANTITY)

The primary keys are underlined. SNO, CNO and ITEMCODE in CONSIGNMENT are foreign key referring to primary keys with the same names.

Show at least two initial non-canonical query trees for the following relational algebra expression. Optimize *one* of them using rules of heuristics.

SELECT SNO, SNAME, CNAME, ITEMCODE, NAME, QUANTITY

FROM SUPPLIER, CUSTOMER, ITEM, CONSIGNMENT

WHERE SUPPLIER.SNO = CONSIGNMENT.SNO

and CUSTOMER.CNO = CONSIGNMENT.CNO

and ITEM.ITEMCODE = CONSIGNMENT.ITEMCODE

and ITEM.NAME = "SG5"

and CONSIGNMENT.QUANTITY > 5

- c) What is the difference between pipelining and materialization in the context of query evaluation ? Illustrate. 2



- 3. a) Write briefly about any three important advantages of distributed database systems. 2
  
- b) Consider a parallel system with shared-nothing architecture. Assume that there are four processors, P0, P1, ..., P3 with associated disks D0, D1, ..., D3. Assume that records with the following keys are partitioned among the disks such that record with key goes to disk  $D_i$  if  $k \bmod 7 = i$  : 6  
30, 16, 27, 26, 15, 18, 14, 25, 0, 9, 8, 7, 6, 24, 10, 15, 21, 14, 13, 6, 21, 22  
Assume that parallel external sort-merge is used to sort the records. What will be the contents of the disks before sorting ? Show the snapshots of data distribution after various steps (range partitioning, sorting, merging, communicating etc.) during sorting. Assume that the following function is used for range-partitioning wherever needed : record with key  $k$  will go to processor  $P_i$  if  $8i \leq k < 8(i + 1)$ .
  
- c) Distinguish between inter-operation and intra-operation parallelism. Illustrate. 2

**Module – 2**

- 4. a) What are the important characteristics that an object identifier should possess ? 2
  
- b) It is necessary to represent the basic details about books. Each book has a title, zero or more authors, publisher, year of publication, price and ISBN. The book has chapters, each with a chapter number and name. Each chapter can have sections. Each section has number and name. A section can have other sections. The book also has appendices each with appendix number and name. The structure of appendix is the same as that of a chapter. Design a DTD for this book structure. 6
  
- c) Write a note on scripting languages. 2
  
- 5. a) Define an object table that store information about courses. Each course has course id, course name, name and designation of the teacher who offers the course and list of students who have enrolled for the course. For each student details such as name, roll no and age are maintained. Write a query in extended SQL that returns names of courses which have been enrolled by more than 20 students. 6
  
- b) Illustrate and explain table inheritance in INFORMIX with a typical example. 4



6. a) Use the DTD below to answer the following queries. Assume that all undeclared elements are of type PCDATA. 6

```

<!DOCTYPE movies[
  <!ELEMENT movies (movie+)>
  <!ELEMENT movies (movie_id, mname, year, director, genre,
    actor+)>
  <!ATTLIST movie language CDATA # REQUIRED>
  <!ELEMENT actor (name, nickname, gender)>
  <!ELEMENT name (fname, lname)>
  ...
]>

```

- i) Names of Malayalam movies (use XPath)
  - ii) Names of movies within which an actor with nickname 'Roby' acted (use XPath)
  - iii) List names of movies and names of actors in those movies (use XQuery).
- b) Write briefly about JDBC. 2
- c) What do you mean by well-formed XML document ? Illustrate. 2

### Module – 3

7. a) What is meant by location based query processing ? Explain. 5
- b) Distinguish between client-server and peer-to-peer mobile databases. 5
8. a) Write an explanatory note on active databases. 5
- b) How is the transaction model in mobile systems different from conventional model ? 5
9. Write explanatory notes on : 10
- i) NoSQL and big data
  - ii) Spatial databases
  - iii) Multimedia databases.
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