Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CSE)/SEM-7/CS-704A/2009-10

2009

DISTRIBUTED DATABASE

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives of the following : $10 \times 1 = 10$

   i) Data Dictionary stores

      a) meta-data about the structure of the database

      b) raw data of tables value

      c) all possible SQL queries

      d) none of these.

   ii) In the 3-tier architecture, the role of application layer is

      a) this layer interacts with the user

      b) this layer programs the application logic

      c) this layer handles query and update request from previous layers

      d) all of these.

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iii) Which software components that are typically necessary for building a distributed database ?

a) The data communication component (DC)

b) The data dictionary (DD)

c) The database management component (DB) and distributed database component (DDB)

d) All of these.

iv) The type of mapping defined in the allocation schema (whether the distributed DBMS is redundant or non-redundant) is

a) One-to-many b) One-to-one

c) Many-to-many d) Many-to-one.

v) Let a global relation be SUPPLIER (SNUM, NAME, CITY), then

$SUPPLIER_1 = SL_{CITY=KOL}$ SUPPLIER,

$SUPPLIER_2 = SL_{CITY=HOW}$ SUPPLIER,

$SUPPLIER_3 = SL_{SNUM,NAME}$ SUPPLIER implies

a) horizontal fragmentation

b) vertical fragmentation

c) derived horizontal fragmentation

d) mixed fragmentation.

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vi) To construct common data model in heterogeneous distributed DBMS, which type of conflicts may arise ?

a) Name conflicts

b) Scale conflicts

c) Structural conflicts

d) All of these.

vii) In basic time-stamping mechanism a transaction having timestamp TS can write on a data x if

a) WTM(x) > TS

b) RTM(x) > TS & WTM(x) > TS

c) RTM(x) > TS

d) RTM(x) ≤ TS & WTM(x) ≤ TS.

viii) In basic time-stamping mechanism a transaction having timestamp TS can read a data x if

a) RTM(x) ≤ TS & WTM(x) ≤ TS

b) RTM(x) > TS & WTM(x) > TS

c) WTM(x) < TS

d) RTM(x) > TS.

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ix) In non-preemptive distributed deadlock prevention

a) younger transactions waits while older aborts and restarts

b) older transactions waits while younger aborts and restarts

c) older transactions waits while younger preempts

d) younger transactions preempts older transactions.

x) Selection and projection operations are called

a) enumerator b) reducer

c) distributor d) synchronizer.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Why do we need checkpoints and cold restart ? Explain with diagram.

3. Compare the features of distributed database versus centralized database.

4. What is replication ? Describe quorum algorithm. 3 + 2

5. Assume that strick two phase locking is in use, describe how the actions of the two phase commit protocol relate to the concurrency control action of each individual server. How does distributed deadlock detection fit in ?

6. Draw the reference architecture of distributed database. What are top-down and bottom-up distributed database designs ? 3 + 2

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GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Why do we use distributed databases ? Briefly point out the reason. 3

   b) What do you mean by unary and binary operations on relational model ? 2

   c) Consider the Global Relation

   PATIENT (NUMBER, NAME, SSN, AMOUNT-DUE, DEPT, DOCTOR, MED-TREATMENT)

   DEPARTMENT (DEPT, LOCATION, DIRECTOR)

   STAFF (STAFFNUM, DIRECTOR, TASK)

   Define there fragmentation as follows :

   i) DEPARTMENT has a horizontal fragmentation by LOCATION, with two locations ; each department is conducted by one DIRECTOR.

   ii) There are several staff members for each department, led by the Department's Director. STAFF has a horizontal fragmentation derived from that of DEPARTMENT and a semi-join on the DIRECTOR attribute.

   iii) PATIENT has a Mixed fragmentation ; attributes NUMBER, NAME, SSN and AMOUNT-DUE constitute a Vertical fragment used for accounting purposes ; attributes NUMBER, NAME, DEPT, DOCTOR and MED-TREATMENT constitute a Vertical fragment used for describing cares. This last fragment has a Horizontal fragmentation derived from that of DEPARTMENT and a semi-join on the DEPT attribute.

   Give also the reconstruction of Global relations from fragments. 2 + 2 + (2 + 2 + 2)

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8. a) How many types of distribution transparency for read-only application are there ? Explain with diagram. 2 + 6

   b) Give an example of equivalence transformations for queries. 2

   c) When does the concepts of Quorum-based protocols arise ? What are the basic rules of this protocol ? 1 + 4

9. Write down the 2-phase commitment protocol with diagram. Discuss the behaviour of the 2-phase commitment protocol in presence of different kinds of failures. 8 + 7

10. a) Draw the diagram with explanation of reference architecture for distributed DBMS. 7

    b) Figure out the fragments and physical images for a global relation. 2

    c) What are the rules for defining fragments ? 1

    d) What are layers to represent the client-server architecture ? Explain the role of each layers. 1 + 4

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11. Write short notes on any *three* of the following : 3 × 5

a) RPC

b) Client server databases

c) Time stamping and synchronization

d) Distributed database administration

e) ODBC connectivity.

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