Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (CSE)/SEM-7/CS-704A/2012-13

2012

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 for the following : $10 \times 1 = 10$

   i) Distributed Database is basically a placement of

      a) Data and Function b) Data and Program

      c) Data and Control d) Program and control.

   ii) The Query optimizer acts as

      a) access path selector

      b) to manage local DBMS remains constant

      c) interpret user command

      d) all of these.

iii) Which software components which 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) During growing phase of Two Phase Locking the 'locks' are

a) released b) acquired

c) both (a) and (b) d) none of these.

v) 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.

vi) All the data of the Global relation must be mapped into the fragments imply

a) Completeness condition

b) Reconstruction condition

c) Disjoint-ness condition

d) all of these.

vii) 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.

viii) When the distributed database developed as a aggregation of existing databases what will be easier approach ?

a) Bottom-Up b) Top-Down

c) Both of these d) None of these.

ix) Cold Restart is required after some catastrophic failure which has

a) caused the los of log information on stable strorage

b) due to frequent access the machine is very hot

c) caused low access speed

d) none of these.

x) 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.

GROUP – B

(Short Answer Type Questions)

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

2. What do you mean by Node & Link failure in DDBMS ? How can you recover these problems ? 2 + 3

3. Why we need Checkpoints and Cold Restart ? Explain with diagram.

4. Compare the features of Distributed Database versus Centralized Database.

5. Draw and explain the state diagrams of 2-Phase Commitment Protocol for non-Blocking.

6. Define equivalence transformation. Explain Commutativity, Associativity of binary operations. 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. What is Distributed Database System ? Explain with diagram reference architecture of a DDBMs. Write down the Date's 12 rule for DDBMS. What is site autonomy ? 2 + 5 + 6 + 2

8. What is serializability in distributed database. Write down the algorithms both Coordinator and Participants of 2PC protocol in distributed environment. Explain with diagram communication structure for different 2PC protocol.

2 + 7 + 6

9. a) Consider the following schemas :

EMP = (ENO, ENAME, TITLE)

ASG = (ENO, PNO, RESP,DUR)

PROJ = (PNO, PNAME, LOC)

Consider the following query :

```
SELECT ENAME
FROM EMP, ASG, PROJ
WHERE EMP.ENO = ASG.ENO
AND PROJ.PNO = ASG.PNO
AND TITLE = 'ELECT ENGG.'
AND DUR = 12
```

Draw the canonical tree and then transform it into optimized tree. 8

b) Simplify the following query using idempotency rules :

```
SELECT ENO
FROM EMP
WHERE (NOT (TITLE="PROGRAMMER")
AND (TITLE="PROGRAMMER" OR TITLE="ELECT ENGG.")
AND NOT (TITLE="ELECT ENGG."))
OR ENAME="TOM" ;
```

4

c) Write short notes on Distributed 2PL protocol. 3

10. a) Consider the following Global schema, Fragmentation schema, Allocation schema, Global schema :

Guest (G_ID, name, block_ID, room_no)

Fragmentation schema :

F1 : $\sigma_{\text{block\_id=“North”}}$ (Guest)

F2 : $\sigma_{\text{block\_id=“South”}}$ (Guest)

Allocation schema : F1 at site 2 and F2 at site 1.

Write a query that accepts G_ID from user and output the name at level 1, 2 and 3 of transparency. 5

b) Explain distributed deadlock detection ? What is the difference between centralized and distributed deadlock detection ? 5 + 2

c) What is hierarchical deadlock detector ? 3

11. a) Write down the algorithm for conservative timestamp method. 5

b) Consider the following schemas : 10

BRANCH (Branch No., Street, Postcode)

PROPERTY (PNO., Rent Amount, Owner No., Type, Branch No.)

Consider the following fragments :

P1 : $\sigma_{\text{Branch\_no=”B003” } \wedge \text{ type=“House”}}$ (PROPERTY)

P2 : $\sigma_{\text{Branch\_no=”B003” } \wedge \text{ type=“Flat”}}$ (PROPERTY)

P3 : $\sigma_{\text{Branch\_no !=”B003”}}$ (PROPERTY)

B1 : $\sigma_{\text{Branch\_no =”B003”}}$ (BRANCH)

B2 : $\sigma_{\text{Branch\_no !=”B003”}}$ (BRANCH)

Optimize the following query :

```
SELECT S
FROM BRANCH b, PROPERTY p
WHERE b.Branch No.= p.Branch No.
AND p.type = ”Flat” ;
```