Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-5/MCAE-501A/2010-11

2010-11

DISTRIBUTED DATABASE MANAGEMENT SYSTEM

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 × 1 = 10

   i) DDBMS provides better ..... over centralized DBMS.

      a) decentralization

      b) tuning

      c) security

      d) transparency.

   ii) One of the popular DDBMS products is

      a) DB2 b) Oracle

      c) ZZQ d) R*.

iii) "Fragmentation transparency cannot be achieved without location transparency."

a) True b) False

c) Unknown d) None of these.

iv) Global Schema, Fragmentation Schema and Allocation Schema reside in

a) one of the machines elected as a coordinator of the DDBMS

b) the system virtually

c) all the machines of the DDBMS network

d) all of these.

v) Which component has the right to communicate distributed information with another component of different machine for running distributed transaction correctly ?

a) Root agent b) DTM

c) LTM d) None of these.

vi) Heterogeneous data source needs ..... design for designing DDBMS.

a) Bottom-up b) Top-down

c) Flat d) none of these.

vii) 3PC protocol ensures non-blocking in case of ..... failure.

a) site b) network

c) partition d) coordinator.

viii) Granularity means

a) size of memory b) size of data

c) locks d) transaction.

ix) The highest level in the hierarchy of data organization is called

a) data bank b) database

c) data file d) data record.

x) What is the maximum number of functional dependencies (trivial and non-trivial) of a relation R of degree n ?

a) $2n$ b) 2^{2n}

c) n ! d) 2^n.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Explain unilateral abort capability in the context of 2-phase commit protocol.

3. Give a brief comparative study between tightly coupled and loosely coupled architectures.

4. What is data replication ? Explain with example. Describe different layers of query processing. 2 + 3

5. Explain checkpoint and cold restart of a distributed database system.

6. What is flat transaction ? Explain with example. What are the factors affecting the allocation ? 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Discuss drawbacks of 2PC protocol in distributed system with an example.

   b) Does 3PC protocol resolve all the problems ? Discuss 3PC protocol with the help of state transition diagram.

   c) Will 3 PC work in case of partition (type of failure) of network ? If not, discuss an algorithm that works in case of partition. 4 + 8 + 3

8. a) "High reliability does not ensure correctness of the distributed system." Comment critically.

b) Show with the help of a diagram that replicated copy of $R2$ of fragment $R1$ is allocated into different sites as R_1^2 and R_2^1.

c) When Bottom-up approach of distributed database design preferable over Top-down approach ?

d) Explain the advantage of Remote access via an auxiliary program in case of heterogeneous distributed database system with the help of a diagram. 6 + 2 + 3 + 4

9. a) Consider the schema SUPPLIER (SNO, NAME, CITY) and SUPPLY (SNO, PNO, DNO, QUAN) and the following transaction :

Read (tty, $PNO)

Select Name into $Name

From SUPPLIER, SUPPLY

Where SUPPLIER.SNO = SUPPLY.SNO

AND SUPPLY.PNO = $PNo

Write (tty, $Name)

What is the level of transparency of the above transaction and why ?

b) Discuss best-fit approach for a non-replicated allocation of horizontal fragmentation.

c) Does any directory file system provide the network transparency ? If yes, explain how the transparency is achieved.

d) What is the most complex effect of update operation in distributed database system ? Explain with the help of update subtree. 3 + 5 + 3 + 4

10. a) Describe different types of failures in DDBMS.

b) Consider the join $R \boldsymbol{JN}_{A=B} S$. Assume that R and S are at different sites, and disregarded the cost of collection the result of the join. Let $\boldsymbol{C}_0 = \boldsymbol{0}$ and $\boldsymbol{C}_1 = \boldsymbol{1}$.

The following profiles are given :

size (R) = 50; card (R) = 100; val ($A[R]$) = 50; Size (A) = 3

size (S) = 5; card (S) = 50; val ($B[S]$) = 50; Size (B) = 3

$R \boldsymbol{SJ}_{A=B} S$ has selectively $\rho = 0{\cdot}2$

$S \boldsymbol{SJ}_{B=A} R$ has selectively $\rho = 0{\cdot}8$

Give the transmission cost of :

i) performing the join at the site of R using semi-join reduction

ii) performing the join at the site of *S* using semi-join reduction

iii) performing the join at the site of *R* without semi-join reduction

iv) performing the join at the site of *S* without semi-join reduction.

Which is the best solution ? 7 + 8

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

a) Vertical and derived fragmentation

b) Distributed deadlock

c) Transparency

d) Heterogeneous databases

e) Non-blocking commitment protocols.