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**Paper Code : MCAE-501A**

# 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 : $10 \times 1 = 10$

   i) What is data about data called ?

   a) Metadata b) Data catalog

   c) Information d) Database.

   ii) Which of the following strategies is designed to ensure that either all the databases are updated or none of them are ?

   a) Two-phase commit b) Two-phase locking

   c) Two-phase update d) 3PC.

iii) Which of the following features(s) is (are) important aspects of a distributed database ?

a) Distribution

b) Logical correlation

c) Distribution & logical correlation

d) Disjointness.

iv) A multiprocessor system where two or more processors share the same primary memory is called

a) homogeneous b) loosely coupled

c) tightly coupled d) multi-OS system.

v) Database profile includes

a) cardinality b) size

c) distinct values d) all of these.

vi) $PJ_A [ R : q_R ]$ implies

a) $[ PJ_A R : q_R ]$ b) $[ PJ_A R : A \text{ AND } q_R ]$

c) $[ PJ_A R : A \text{ OR } q_R ]$ d) $[ PJ_A qr : R ]$.

vii) Local Mapping schema depends on the

a) global relations

b) fragments

c) type of the local DBMS

d) location.

viii) Processing locality conflicts with

a) availability and reliability of distributed data

b) workload distribution

c) storage cost and availability

d) none of these.

ix) Location transparency can be compared with

a) Fragmentation transparency

b) Local mapping transparency

c) Replication transparency

d) none of these.

x) Top-down approach to the design of data distribution is applicable when

a) we are developing a system from scratch

b) as the aggregation of existing databases

c) both of these

d) none of these.

## GROUP – B

### ( Short Answer Type Questions )

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

2. Prove that

$$[R : q_R] SJ_F [S : q_S] \geq [R SJ_F S : q_S \text{ AND } q_S \text{ AND } F].$$

3. What is Mixed Fragmentation ? Explain with an example.

4. Write the rules to follow when defining fragments.

5. What is locking ? What is the shared and exclusive locks ? Discuss the Timestamp protocol in relation with Distribution Database System. 1 + 2 + 2

6. Explain the significance of the semi-join program in context with DDBMS.

## GROUP – C

### ( Long Answer Type Questions )

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

7. a) What is the difference between reliability and availability ?

b) Describe different types of distributed failure.

c) Write down the query optimization algorithm of INTEGERS. 3 + 5 + 7

8. a) What is horizontal fragmentation ? Explain example.

b) Write the Phorizontal Algorithm and explain it with proper example. 5 + 10

9. a) Describe two phase commit protocol. What are the demerits of this protocol ?

b) Explain deadlock avoidance of DBMS.

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

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

b) Consider the join R $JN_{A=B}$ S ; assume that *R* and *S* are at different sites and disregarded the cost of collection the result of the join. Let $C_0 = 0$ and $C_1 = 1$.

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 $SJ_{A=B}$ S has selectively $\rho = 0.2$

S $SJ_{B=A}$ R has selectively $\rho = 0.8$

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 solutions ? 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.