



CS/MCA (SUPPLE)/SEM-5/MCAE-501A/09
DISTRIBUTED DATABASE MANAGEMENT SYSTEM
SEMESTER - 5



Time : 3 Hours]

[Full Marks : 70

GROUP – A**(Multiple Choice Type Questions)**

1. Choose the correct alternatives for the following : 10 × 1 = 10
- i) Data replication is a
- a) technique of breaking up the database into logical units, which may be assigned for storage at the various sites
 - b) process of deciding about locating data to several sites
 - c) technique that permits storage of certain data in more than one sites
 - d) none of these.
- ii) A horizontal fragmentation is produced by specifying a
- a) predicate operation of relational algebra
 - b) projection operation of relational algebra
 - c) selection and predicate operations of relational algebra
 - d) none of these.
- iii) In a DDBMS, the deadlock prevention method by aborting the transaction can be used such as
- a) time stamping
 - b) wait-die
 - c) wound-wait
 - d) none of these.

**GROUP – B****(Short Answer Type Questions)**Answer any *three* of the following.

3 × 5 = 15

2. What is distributed database ? What is DDBMS ? What are the features of DDBMS ?
3. What is the difference between reliability and availability ? What is nested transaction ?
4. Explain the different types of failures in DDBMS.
5. What is the difference between tightly coupled and loosely coupled architecture ?
6. Explain the cold starts and warm starts.

GROUP – C**(Long Answer Type Questions)**Answer any *three* of the following.

3 × 15 = 45

7. Consider the global relations :

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

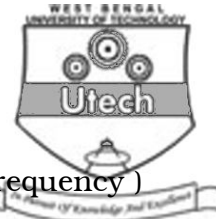
DEPARTMENT (DEPT, LOCATION, DIRECTOR)

STAFF (STAFFNUM, DIRECTOR, TASK)

Define their fragmentation as follows :

- a) DEPARTMENT has a horizontal fragmentation by LOCATION, with two locations, each department is conducted by one DIRECTOR.
- b) There are staff members for each department, led by the department's director. STAFF has a horizontal fragmentation derived from that of DEPARTMENT and semi-join on the DIRECTOR attribute. Which assumption is required in order to assure completeness and disjointness ?
- c) Write down the rules for fragmentation in detail.
- d) Briefly describe the reference architecture of a distributed database.

3 + 4 + 3 + 5



8. Consider the following *two* allocations of fragments :

- a) R_1 at site 1 ; R_2 at site 2 ; R_3 at site 3
 b) R_1 and R_2 at site 1 ; R_2 and R_3 at site 3.

With the following applications (all with same activation frequency)

A1, issued at site 1 reads 5 records of R_1 and 5 records of R_2

A2, issued at site 3 reads 5 records of R_3 and 5 records of R_2

A3, issued at site 2 reads 10 records of R_2 .

- a) if we take locality of reference as objective, which solution is best ?
 b) if we take complete locality of application as objective, which solution is the best ?
 c) assume now that A3 updates 10 records of R_2 . Taking the locality of reference as objective, which one is the best ?
 d) what do you mean by distribution transparency ? Discuss different levels of distribution transparency. 2 + 4 + 3 + 6
9. a) What is serializability in a distributed database ?
 b) Discuss about 2-phase locking as a distributed concurrency control method.
 c) Let two objects x, y be stored at site S1 and z and w be stored at site S2. Determine for each of the following executions, whether the execution is serializable or not. If yes, determine all possible total orders of transactions. If not, then prove that there is no total order possible.

Execution 1 :

S1 : R1 (x) R2 (x) W2 (x) W1 (x)

S2 : R2 (w) R2 (z) W2 (w) W1 (w)

Execution 2 :

S1 : R (x) ~ (x) W2 (y) W1 (y)

S2 : W1 (z)

Execution 3 :

S1 : R (x) R2 (x) W1 (x) W2 (y)

S2 : R (z) ~ (z) W2 (z) W1 (w)

Execution 4 :

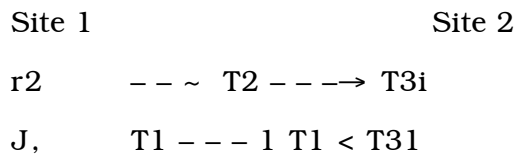
S1 : R (y) R2 (x) W2 (x)

S2 : W1 (z) R1 (w) R2 (w) W1 (w).

2 + 6 + 7



10. a) Why are distributed deadlocks occurred ?
 b) What are distributed wait-for graph and local wait-for graph ? How does wait-for graph help in deadlock detection ?
 c) What is false deadlock ?
 d) Consider the following wait-for graph.



Where Tj's are the transactions and -- ~ waiting for the case of different transactions ---> waiting in the case of same transactions.

Detect the deadlock occurred here.

2 + 6 + 2 + 5

11. a) Consider the following SQL query :

```

SELECT ENAME, RESP
FROM EMP, ASG, PROJ
WHERE EMP.ENO = ASG.ENO
AND PNAME = "CAD/CAM"
AND DUR ~ 36
AND TITLE = "Programmer"
    
```

Draw its Query Graph.

- b) Given a Relation EMP (ENO, ENAME, TITLE) and its three horizontal fragments defined as follows :

```

EMP } = a ENO ~ "E3"(EMP)
EMP 2 = 0"/:"3" < ENO ~ "E6" (EMP)
EMP3 = cr > "E6" (EMP)
ENO
    
```

Now, consider the following example query :

```

SELECT *
FROM EMP
WHERE ENO = "E5"
    
```

Draw the Operator Tree for the Generic Query and also for the Reduced Query.

7 + 8



12. a) Why do we need reliability in distributed database ?
- b) Differentiate between blocking and non-blocking commitment protocols in distributed database.
- c) State the protocols which can deal with partitions.
- d) Write notes on any *two* of the following :
- i) Weighted majority locking
 - ii) Primary copy locking
 - iii) Write-locks-all.



2 + 3 + 2 + 8

END