

**ADVANCED DATABASE MANAGEMENT SYSTEMS
(CSEN 5103)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Which of the following is a distributed database?
 - (a) A single logical database that is spread to multiple locations and is interconnected by a network
 - (b) A loose collection of file that is spread to multiple locations and is interconnected by a network
 - (c) A single logical database that is limited to one location
 - (d) A loose collection of file that is limited to one location.
 - (ii) ___ fragmentation allows us to break a single object into two or more segments or fragments.
 - (a) Horizontal (b) Vertical (c) Data (d) Mixed.
 - (iii) What is the cardinality of a table with 50 rows and 5 columns?
 - (a) 50 (b) 5 (c) 250 (d) None of these.
 - (iv) Location transparency allows for which of the following?
 - (a) Users to treat the data as if it is at one location
 - (b) Programmers to treat the data as if it is at one location
 - (c) Managers to treat the data as if it is at one location
 - (d) All of the above.
 - (v) The HAVING clause does which of the following?
 - (a) Acts EXACTLY like a WHERE clause.
 - (b) Acts like a WHERE clause but is used for columns rather than groups.
 - (c) Acts like a WHERE clause but is used for groups rather than rows.
 - (d) Acts like a WHERE clause but is used for rows rather than columns.

- (vi) _____ is a special type of stored procedure that is automatically invoked whenever the data in the table is modified.
 - (a) Procedure (b) Trigger
 - (c) Curser (d) None of the Mentioned.
- (vii) The SQL statement SELECT SUBSTR('123456789', INSTR('abcabcabc','b'), 4) FROM EMP; prints
 - (a) 6789 (b) 2345 (c) 1234 (d) 456789.
- (viii) Which of the following is a semijoin?
 - (a) Only the joining attributes are sent from one site to another and then all of the rows are returned.
 - (b) All of the attributes are sent from one site to another and then only the required rows are returned.
 - (c) Only the joining attributes are sent from one site to another and then only the required rows are returned.
 - (d) All of the attributes are sent from one site to another and then all the rows are returned.
- (ix) A is a logical grouping of database objects, usually to facilitate security, performance, or the availability of database objects such as tables and indexes.
 - (a) tablespace (b) extents (c) segments (d) blocks.
- (x) Two-phase commit mechanism is completely transparent to users who issue _____.
 - (a) Commit a transaction (b) Rollback a transaction
 - (c) Non distributed transactions (d) Distributed transactions.

Group - B

2. (a) Consider the following global relations:
PATIENT (NUMBER, NAME, PAN, AMT_DUE, DEPT, DOCTOR, MED_TREAT)
DEPARTMENT1(DEPT, LOCATION, DIRECTOR)
STAFF(STAFFNUM, DIRECTOR, TASK)
Define each of the following fragmentation:
(i) DEPARTMENT1 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 the DEPARTMENT1 and a semi-join on the DIRECTOR attribute. Which assumption is required in order to

assure completeness and disjointness?

(iii) PATIENT has a mixed fragmentation: attributes NUMBER, NAME, PAN and AMT_DUE constitute a vertical fragment used for accounting purposes; attributes NUMBER, NAME, DEPT, DOCTOR and MED_TREAT constitute a vertical fragment used for describing cares. This last fragment has a horizontal fragmentation derived from that of DEPARTMENT1 and a semi-join on the DEPT attribute. Which assumption is required in order to assure completeness and disjointness?

2 + 4 + 6 = 12

3. (a) Explain local mapping transparency with an example.
- (b) For the given relation (below) explain horizontal fragmentation according to branch No.

Staff							
staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	Ayan	Das	Manager	M	01-Oct-95	300000	B005
SG37	Pallabi	Putatunda	Supervisor	F	01-Dec-95	300000	B003
SG14	Kuntal	Kesh	Assistant	M	24-Mar-78	50000	B003
SA9	Ambari	Pyne	Assistant	F	19-Feb-90	65000	B007
SG5	Niladri	Sarkar	Manager	M	01-Oct-96	400000	B003
SL41	Sarbani	Sarkar	Assistant	F	05-Oct-85	75000	B005

- (c) Prove that the above fragmentation satisfies all the correctness rules of fragmentation.

4 + 4 + 4 = 12

Group - C

4. Explain in details Distributed Transaction Management. What is distributed serializability? Explain with example. Explain Time Stamp based concurrency control protocol.
- 3 + 3 + 3 + 3 = 12**
5. (a) Explain check point and cold restart of a distributed database system.
 - (b) Determine common sub expressions in the following global query based on global relations: SUPPLY(suppno, prdno, deptno, quant), DEPT(deptno, dname, area, mgrno).

Do step by step transformations by showing the operator tree of each step along with total no tuples processed in each operator tree, in order to achieve an optimized query.

(SL_{deptno=10}Dept **NJN** (SL_{prdno='P1'} SUPPLY **DF** SL_{deptno='20'} SUPPLY))

UN (SL_{deptno=10}Dept **NJN** SL_{prdno='P1'} SUPPLY)

(Here SL, NJN, DF, and UN are select, natural join, difference and union operator).

3 + 9 = 12

Group - D

6. (a) What are the various methods of controlling concurrency?
- (b) What would happen if there is no rollback mechanism (undo mechanism) in databases? Explain with an example.
- (c) What is Phantom Phenomenon?

4 + 6 + 2 = 12

7. Discuss the drawbacks of 2PC protocol in distributed system with an example. Does 3PC protocol resolve all problems? Discuss 3PC protocol with the help of state transition diagram. Explain Network Partitioning.

4 + 2 + 4 + 2 = 12

Group - E

8. (a) Differentiate between pipelined parallelism and partitioned parallelism with structures.
 - (b) Why Unique timestamp generation is difficult in DDBMS than Centralized DBMS?
 - (c) How 3-phase commitment protocol overcomes the limitation of 2-phase commitment protocol?
- 4 + 4 + 4 = 12**
9. (a) What is temporal database?
 - (b) How does temporal database differ from conventional database?
 - (c) What is ORDBMS?
 - (d) What is statistical database and how is it related to population?

2 + 3 + 2 + (2 + 3) = 12