



HERITAGE INSTITUTE OF TECHNOLOGY

1st Semester Examination. M.Tech Session : 2014-15

Discipline : Computer Science & Engineering

Paper Code : CSEN5103 Paper Name : Advanced Database Management System

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 x 1=10
- (i) Which of the following is not a storage manager component?
(a) Transaction Manager (b) Logical Manager
(c) Buffer Manager (d) File Manager
- (ii) Which of the following statements are true? (choose all that apply)
(a) Primary key constraints allow NULL values in the columns.
(b) Unique key constraints allow NULL values in the columns.
(c) Primary key constraints do not allow NULL values in columns.
(d) A non-unique index cannot be used to enforce a primary key constraint.
- (iii) A semi join is which of the following
(a) Only the joining attributes are sent from one site to other site and then all 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.
- (iv) Which of the following is true concerning a global transaction?
(a) The required data are at one local site and the distributed DBMS routes requests as necessary.
(b) The required data are located in at least one nonlocal site and the distributed DBMS routes requests as necessary.
(c) The required data are at one local site and the distributed DBMS passes the request to only the local DBMS.
(d) The required data are located in at least one nonlocal site and the distributed DBMS passes the request to only the local DBMS.



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- (v) Consider the following schedules involving two transactions. Which one of the following statements is TRUE?
- $S_1: r_1(x), r_1(y), r_2(x), r_2(y), w_2(y), w_1(x)$
 $S_2: r_1(x), r_2(x), r_2(y), w_2(y), r_1(y), w_1(x)$
- (a) Both S_1 and S_2 are conflict serializable
(b) S_1 is conflict serializable and S_2 is not conflict serializable
(c) S_1 is not conflict serializable and S_2 is conflict serializable
(d) Both S_1 and S_2 are not conflict serializable
- (vi) 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.
- (vii) What is the cardinality of a table with 50 rows and 5 columns
- (a) 50 (b) 5
(c) 250 (d) None of these
- (viii) The object definition language (ODL) is which of the following?
- (a) Used to develop logical schemas
(b) A data definition language for OODB
(c) A method to implement a logical schema
(d) All of the above.
- (ix) Which of the following is true concerning an ODBMS?
- (a) They have the ability to store complex data types on the Web.
(b) They are overtaking RDBMS for all applications.
(c) They are most useful for traditional, two-dimensional database table applications.
(d) All of the above.
- (x) Two Phase Commit Protocol
- (a) Concurrency control (b) Integrity Control
(c) Recovery (d) Redundancy



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Group - B

- 2.(a) Consider the following two allocation level design of fragments R1, R2 and R3
 - a) Allocation Design 1: R1 at site 1; R2 at site 2; R3 at site 3;
 - b) Allocation Design 2: R1 and R2 at site 1; R2 and R3 at site 3.

With the following applications (all with same frequency of execution).

- I. A1, issued at site 1, reads 5 records of R1 and update 5 records of R2.
- II. A2, issued at site 3, update 5 records of R3 and update 5 records of R2
- III. A3, issued at site 2, reads 10 records of R1, update 8 records of R2.

A single update to read cost ratio is 2. If we take locality of reference as the objective of allocation, which of the above two design of allocation schema is better. Justify your answer.

- (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 **DFSL**_{deptno='20'} SUPPLY))

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

(Here SL, NJN, DF, and UN are select, natural join, difference and union operator.) 6 + 6 = 12

- 3.(a) State correctness rules of fragmentation?

- (b) **Staff**

staffNo	fName	iName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000	B005

For this given relation explain horizontal fragmentation according to branchNo.

- (c) Prove that this fragmentation satisfies all the rules of fragmentation

6 + 3 + 3 = 12

Group - C

- 4(a) Explain distributed serializability with a suitable example. Explain TimeStamp based concurrency control protocol. How distributed 2 phase locking protocol and 2PC protocol are related to each other. What is the difference between parallel database and distributed database?



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(b) Let object x and y be stored at site 1, and objects z and k be stored at site 2. Determine, for each of the following executions, whether the execution is serializable or not. If the answer is affirmative, determine all possible total orders of transactions. If answer is negative, prove that there is no total order possible.

Execution 1:

S1: $R_i(x) R_j(x) W_j(y) W_i(x)$
S2: $R_i(k) R_j(z) W_j(k) W_i(k)$

Execution 2:

S1: $R_i(x) R_j(x) W_j(y) W_i(y)$
S2: $W_i(z)$

Execution 3:

S1: $R_i(x) R_j(x) W_i(x) W_j(y)$
S2: $R_i(z) R_j(z) W_j(z) W_i(k)$

Execution 4:

S1: $R_i(y) R_j(x) W_j(x)$
S2: $W_i(z) R_i(k) R_j(k) W_i(k)$

(2+2+
1+1)+6
= 12

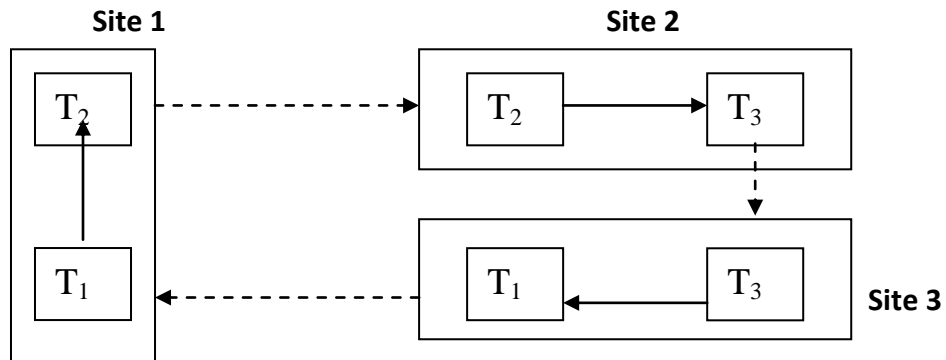
5.(a) What do you mean by valid time and transaction time in temporal database?

(b) Discuss different security measure of statistical database.

4 + 8= 12

Group - D

6.(a) Consider the following distributed wait-for-graph (DWFG):



Detect the deadlock using distributed deadlock algorithm.



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- (b) How many message transfers are required for a global update operation that has agents at n sites with a centralized lock manager?
- (c) What do you mean by lost update problem? 5 + 3 + 4 = 12
- 7.(a) Describe different steps of SDD-I algorithm with assumption for query optimization.

(b) Consider following query and solve it by applying SDD-I algorithm to find the final site for join and query execution strategy.

select $R_3.C$ from R_1, R_2, R_3 where $R_1.A = R_2.A$ and $R_2.B = R_3.B$

DBMS statistics are as follows

Relation	Cardinality	Tuple size	Relation size
R_1	30	50	1500
R_2	100	30	3000
R_3	50	40	2000

Attribute	SF_{S_j}	$Size(\Pi_{attribute})$
$R_1.A$	0.3	36
$R_2.A$	0.8	320
$R_2.B$	1.0	400
$R_3.B$	0.4	80

5 + 7 = 12

Group - E

- 8.(a) Specify the layers of distributed query processing and optimization.
- (b) What is OODBMS? What is ORDBMS? What are the advantages of OODBMS? 6 + (2+2+2) = 12
- 9. Write Short notes on any three of the following: 3 x 4 = 12
 - a) Fragmentation Transparency
 - b) Query graph
 - c) Majority locking protocol
 - d) Wound–wait protocol.
 - e) Database replication



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