M.TECH/CSE/1ST SEM /CSEN 5103/2015
2015

Advanced Database Management Systems
(CSEN 5103) 23

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 alternatives for the following: **10 x 1=10**

(i) Which of the following is storing a separate copy of the database at multiple locations?
- (a) Data Replication
- (b) Horizontal Partitioning
- (c) Vertical Partitioning
- (d) Horizontal and Vertical Partitioning.

(ii) In a heterogeneous distributed DBMS
- (a) two different sites can use two different DBMS products, but data model must be the same.
- (b) two different sites can use two different data model, but DBMS product must be the same.
- (c) two different sites can use both different DBMS products and data models.
- (d) two different sites can use both different DBMS products, but database languages must be the same.

(iii) Preservation of functional dependency is ensured by which of the correctness rule of the fragmentation?
- (a) Disjointness
- (b) Reconstruction
- (c) Completeness
- (d) All of these.

(iv) Which of the following statement is true?
- (a) Horizontal fragmentation is subset of tuples.
- (b) Vertical fragmentation is subset of attributes.
- (c) Mixed fragmentation is subset of a combination of tuples and attributes.
- (d) All of these.

(v) Which of the following strategies a distributed database can use?
- (a) Totally centralized at one location and accessed by many sites
- (b) Partially or totally replicated across sites
- (c) Partitioned into segments at different sites
- (d) All of the above.

(vi) Let a Global relation be SUPPLIER (SNUM, NAME, CITY),
then $SUPPLIER_1 = Select_{CITY = KOLKATA}$ SUPPLIER,
$SUPPLIER_2 = Select_{CITY = HOWRAH}$ SUPPLIER and
$SUPPLIER_3 = Select_{SNUM, NAME}$ SUPPLIER implies
(a) Horizontal fragmentation (b) Vertical fragmentation
(c) Derived Horizontal fragmentation (d) Mixed fragmentation.

(vii) A distributed database has advantages over a centralized database in which of the following?
(a) Software cost (b) Software complexity
(c) Slow Response (d) Modular growth.

(viii) When the distributed database developed as an aggregation of existing databases what will be easier approach?
(a) Bottom-Up (b) Top-Down (c) Both of these (d) None of these.

(ix) 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.

(x) Which of the following can be the techniques used in Statistical Database for handling sparseness?
(a) Leave the null values in there and use compression techniques to squeeze them out
(b) Rmove the entries that only have null values.
(c) Both a and b.
d) None of these.

Group – B

2. Consider the Global Relation (in bold font)
PATIENT (NUMBER, NAME, SSN, AMOUNT-DUE, DEPT, DOCTOR, MED-TREATMENT);
DEPARTMENT(DEPT, LOCATION, DIRECTOR);
STAFF (STAFFNUM,DIRECTOR, TASK)
Define their fragmentation using SQL or relational algebra notation, on basis of the following requirements of the DDBMS:

(i) **DEPARTMENT** has a Horizontal fragmentation by LOCATION, with two possible locations. There are three departments named D1, D2, D3.

(ii) There are several staff members for each department, led by the director of the department. Each department is controlled by one director, only and vice versa. Schema **STAFF** has a Horizontal fragmentation derived from that of DEPARTMENT and a semi-join on the DIRECTOR attribute.

(iii) **PATIENT** has a Mixed fragmentation; A Vertical **fragment$_1$** consisting of attributes NUMBER, NAME, SSN and AMOUT-DUE is used for accounting purposes. Another vertical **fragment$_2$** consisting of attributes NUMBER, NAME, DEPT, DOCTOR and MED-TREATMENT is used for describing treatment and cares. This second **fragment$_2$** has a Horizontal fragmentation derived from that of DEPARTMENT and a semi-join on the DEPT attribute.

(iv) Show the reconstruction of all the Global relations from the defined fragments.

(2+2+5+3) =12

3.(a) Explain local mapping transparency with an example?

(b) For the given relation (below) explain horizontal fragmentation according to branchNo.

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.(a) Define equivalence transformation.

(b) Consider the following schemas: **EMP** (ENO, ENAME, TITLE);
ASG (ENO, PNO, RESP,DURATION); **PROJ**(PNO, PNAME, LOC)
Draw the canonical tree of the following query and then transform it into optimized tree:
SELECT ENAME FROM EMP, ASG, PROJ WHERE EMP.ENO = ASG.ENO AND PROJ.PNO = ASG.PNO AND TITLE = 'ELECT ENGG.' AND DURATION = 12;

2+(5+5)=12

5.(a) In the context of distributed transaction, briefly discuss the responsibilities of i)transaction manager and ii)transaction coordinator.

(c) Simplify the following query using idem-potency rules, based on the schema **EMP** (ENO, ENAME, TITLE):

SELECT ENO FROM EMP WHERE (NOT (TITLE="PROGRAMMER") AND (TITLE="PROGRAMMER" OR TITLE="ELECT_ENGG.") AND NOT (TITLE="ELECT_ENGG.")) OR ENAME="TOM" ;

(3+4)+5 = 12