Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(CSE)/SEM-2/MCSE-203/2010

2010

ADVANCED DATABASE MANAGEMENT SYSTEMS

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 × 1 = 10

   i) Which one of the following is a trivial dependency ?

      a) AB ∅ A b) A ∅ A

      c) Both (a) and (b) d) None of these.

   ii) A table can be logically connected to another table by defining a

      a) hyperlink b) common field

      c) primary key d) foreign key.

   iii) F covers E implies

      a) every FD in E also in F+

      b) every FD of F also in E+

      c) both (a) and (b)

      d) none of these.

iv) The relation R = (ABC) and set of functional dependencies F = { A ∅ B, B ∅ C }. R is decomposed in two different ways R1 = (AB), R2 = (BC). This is

a) loss-less join decomposition

b) dependency preserving

c) both (a) and (b)

d) none of these.

v) The steps of ARIES recovery algorithm are

a) analysis b) redo

c) undo d) all of these.

vi) Autonomy refers to the distribution of

a) data b) control

c) function d) none of these.

vii) The condition which must be followed while defining horizontal fragmentation is

a) completeness b) reconstruction

c) disjointness d) all of these.

viii) Join graph is used in

a) primary horizontal fragmentation

b) vertical fragmentation

c) derived fragmentation

d) all of these.

ix) The query optimizer acts as

a) access path selector

b) to manage local database remains constant

c) interpret user command

d) all of these.

x) Distributed database is basically placement of

a) data and function b) data and program

c) program and control d) data and control.

GROUP – B

(Short Answer Type Questions)

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

2. Draw an extended ER diagram of your own college.

3. a) Why is normalization needed ?

b) What are the anomalies of a relation ?

4. Consider the following schema :

Suppliers (sid,sname,addres)

Parts (pid,pname,color)

Catalog (sid,pid,cost)

State what the following queries compute :

a) π sname (π sid (σ color=red Parts) $\bowtie$ (σ cost<100Catalog) $\bowtie$ Suppliers)

b) π sname (π sid ((σ color=red Parts) $\bowtie$ (σ cost<100 Catalog) $\bowtie$ Suppliers))

5. Explain 3-phase commit protocol. Why is it non-blocking ?

6. What are local, global and external schema ? What is multidatabase system ?

GROUP – C

(Long Answer Type Questions)

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

7. a) Consider a relation R (A B C D E F G H I J) and the FDs are given as

   F = { AB ∅ C, A ∅ DE, B ∅ F, F ∅ GH, D ∅ IJ }

   Find out the candidate key and also the super key set.

   b) Write down the general algorithm for finding out the candidate key.

   Consider Student (USN, Name) with FDs F = { USN ∅ Name, Name ∅ USN }. Find out the candidate key.

   c) Who are the users of DBMS ? 7 + 7 + 1

8. a) Suppose that we decompose the schema

   R = (A, B, C, D, E) into

   (A B C)

   (A D E).

   Show that the decomposition is lossles decomposition if the following set F of functional dependencies holds :

   A ∅ BC

   CD ∅ E

   B ∅ D

   E ∅ A

   b) Find out the canonical cover of the following relation R (A B C) with FDs

   A ∅ BC

   B ∅ C

A ∅ B

AB ∅ C

c) Why is relational algebra needed ? 7 + 7 + 1

9. a) What is view serializability ? Consider the schedule. Test whether they are conflict serializable schedule or not

T1	T2
Read(A)	
Write(A)	
	Read(A)
	Write(A)
Read(B)	
Write(B)	
	Read(B)
	Write(B)

b) What are immediate and deferred updates in a log based recovery ? Explain with diagram.

c) Draw the state transaction diagram and explain.

5 + 5 + 5

10. a) What are the methods to prevent unauthorized access in distributed database ?

b) Explain the concurrency control mechanisms.

c) Suppose that 2 PC with presumed is used as commit protocol. Explain how the system recovers from failure and deals with a particular transaction *T* in each of the following cases :

i) A subordinate site for *T* fails before receiving a prepare *T* message.

ii) A subordinate site for *T* fails after receiving a prepare message but before making a decision.

iii) A subordinate site for *T* fails after receiving a prepare message and force writing an abort log record but before responding to the prepare message.

iv) A subordinate site for *T* fails after receiving a prepare message and force writing a prepare log record but before responding to the prepare message.

v) A subordinate site for *T* fails after receiving a prepare message and force writing an abort log record and sending a no vote.

vi) The coordinator of site *T* fails before sending a prepare message.

vii) The coordinator of site *T* fails after sending a prepare message but before collecting all votes.

viii) The coordinator of site *T* fails after writing an abort log record but before sending any further message to its subordinates.

ix) The coordinator of site *T* fails after writing a commit log record but before sending any further message to its subordinates.

x) The coordinator of site *T* fails after writing an end log record. $2\frac{1}{2} + 2\frac{1}{2} + 10$

11. a) What do you mean by local mapping transparency and replication transparency ?

b) Consider the following global fragmentation and allocation schemata :

Global Schema : STUDENT (ROLL, NAME, DEPT)

Fragmentation Schema : $STUDENT_1 = SL_{DEPT = \text{“IT”}}$ STUDENT

$STUDENT_2 = SL_{DEPT = \text{“CS”}}$ STUDENT

Allocation Schema : $STUDENT_1$ at sites 1, 2

$STUDENT_2$ at sites 3, 4

(Assume that “IT” and “CS” are the only possible values for DEPT attribute)

i) Write an application that requires the roll number of student from terminal and outputs the name and department, at levels 1, 2 and 3 of transparency.

ii) Write an application that moves the student having roll number 432 from department “IT” to department “CS”, at levels 1, 2 and 3 of transparency. 5 + (5 + 5)