DATABASE MANAGEMENT SYSTEM II
(MCAP 2103)

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) The property of transaction that persists all the crashes is
(a) atomicity (b) durability
(c) isolation (d) all of these.

(ii) Isolation of the transactions is ensured by
(a) transaction management (b) application programmer.
(c) concurrency control (d) recovery management.

(iii) Which of the following is a tuple-generating dependencies?
(a) functional dependency
(b) equality-generating dependencies
(c) multivalued dependencies
(d) non-functional dependency.

(iv) Problems occurs if we don't implement proper locking strategy
(a) dirty reads (b) phantom reads
(c) lost updates (d) unrepeatable reads.

(v) The execution sequences in concurrency control are termed as
(a) serials (b) schedules
(c) organizations (d) time tables.

(vi) Which of the following code will open a cursor named cur_employee?
(a) OPEN cur_employee
(b) OPEN CURSOR cur_employee
(c) FETCH cur_employee
(d) FETCH CURSOR cur_employee

(vii) In two-phase locking protocol, a transaction obtains locks in _____ phase.
(a) shrinking phase (b) growing phase
(c) running phase (d) initial phase.

(viii) Shadow Paging is used for
(a) writing same item at same location
(b) writing same item at different location
(c) creating shadows
(d) none of the above.

(ix) A _____ is a special kind of a store procedure that executes in response to certain action on the table like insertion, deletion or updation of data.
(a) procedures (b) triggers
(c) functions (d) package.

(x) In DDBMS, distributed physical data independence is provided by
(a) local conceptual schema (b) local external schema
(c) global conceptual schema (d) local mapping schema.

Group - B

2. (a) Define the multivalued functional dependency. Illustrate with an example.

(b) Explain the distinction between the terms serial schedule and serializable schedule, with example.

(c) Consider the following two transactions:

$T1$: read (A);
read (B);
if $A = 0$ **then** $B := B + 1$;
write (B);

$T2$: read (B);
read (A);
if $B = 0$ **then** $A := A + 1$;
write (A);

Let the consistency requirement be $A = 0$ or $B = 0$, with $A = B = 0$ the initial values.

(i) Show that every serial execution involving these two transactions preserves the consistency of the database.

(ii) Show a concurrent execution of $T1$ and $T2$ that produces a nonserializable schedule.

(iii) Is there a concurrent execution of $T1$ and $T2$ that produces a serializable schedule?

(2 + 1) + 3 + (3 ×2) = 12

3. (a) In multiple-granularity locking, what is the difference between implicit and explicit locking?

(b) Discuss the timestamp ordering protocol for concurrency control.

(c) Describe the wait-die and wound-wait protocols for deadlock prevention.

2 + 5 + 5 = 12

Group - C

4. (a) Consider two transactions T1 and T2 as follows:

T1	T2
Read (A, a);	Read (C, c);
a = a - 100;	c = c - 200;
Write (A, a);	Write (C, c);
Read (B, b);	
b = b + 100;	
Write (B, b);	

T1 and T2 are executed serially i.e., T1 → T2. The values of A, B and C before the execution are 1000, 2000 and 3000 respectively. If immediate database modification technique used then what will be the contents of log and Database? What happens if a crash occurs :

(i) Just after write (B, b)
(ii) Just after write (C, c)
(iii) Just after < T2, Commit >?

(b) Explain the Memory Structures of system global area (SGA) of RDBMS.

(4 + 4) + 4 = 12

5. (a) Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed? How does the frequency of checkpoints affect
(i) system performance when no failure occurs
(ii) the time it takes to recover from a system crash.
(iii) the time it takes to recover from a disk crash.

(b) Write down the difference between log-based recovery and shadow paging technique.

(c) What implications would a no-steal/force buffer management policy have on check pointing and recovery?

(d) Explain the difference between the three storage types – volatile, nonvolatile, and stable – in terms of I/O cost.

(1 + 1) + 3 + 2 + 2 + 3 = 12

Group - D

6. (a) An HRD manager has decided to raise the salary of employees working in department number 20 by 20%. Write a PL/SQL block to update the above using implicit cursors.

(b) Construct a trigger to calculate the Income Tax amount and insert it in EMP table.
If salary ≥ 50000 then income_tax = 10%
If salary ≥ 100000 then income_tax = 15%
If salary ≥ 200000 then income_tax = 20%

(c) Write down the Execution Hierarchy of Trigger in PL/SQL.

5 + 5 + 2 = 12

7. (a) How Exception handling works using oracle engine?

(b) What are sequences? Explain with example.

(c) Create a package comprising of a procedure and a function
(i) First procedure check for the number is > 0 or not.
(ii) Second function will check if it is prime or not.

3 + (2 + 1) + (3 + 3) = 12

Group - E

8. (a) Explain the concept of distributed database. Explain the various features of distributed database. What are the advantages of distributed database?

(b) Describe with example the horizontal and vertical fragmentation in Distributed DBMS.

(2 + 4 + 2) + 4 = 12

9. (a) Explain the concept of temporal database.

(b) Explain with example, the valid time and transaction time in temporal database.

(c) Differentiate between early binding and late binding.

4 + 4 + 4 = 12