MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : IT-601

DATABASE MANAGEMENT SYSTEM

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 any *ten* of the following : $10 \times 1 = 10$

   i) Which of the following is correct ?

   a) AK = CK – PK b) CK = AK – PK

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

   where, AK = Alternate key, PK = Primary key, FK = Foreign key, CK = Candidate key.

   ii) A rule that states that no component of primary key can be NULL is called

   a) Security rule

   b) Entry integrity rule

   c) Referential integrity rule

   d) none of these.

iii) If relation A has m rows and p columns while relation B has n rows and q columns, then number of rows and columns in $A \times B$ will be respectively

a) $m \times n$ and $p \times q$ b) $m + n$ and $p \times q$

c) $m \times n$ and $p + q$ d) $m + n$ and $p + q$.

iv) Which is not an ACID property ?

a) Atomicity b) Integrity

c) Consistency d) Durability.

v) Which of the following operations is used if we are interested in only certain columns of a table ?

a) PROJECTION b) SELECTION

c) UNION d) JOIN.

vi) Which command is used for removing a table and all its data from the database ?

a) Create command

b) Drop table command

c) Alter table command

d) All of these.

vii) The drawback(s) of shadow paging technique is/are

a) Commit overhead b) Data fragmentation

c) Garbage collection d) all of these.

viii) In which normal form every non-key attribute is fully functionally dependent on the primary key of a relation ?

a) 1NF b) 2NF

c) PJNF d) DKNF.

ix) Which phase is not a part of two phase locking protocol ?

a) Growing phase b) Shrinking phase

c) Stabilization phase d) None of these.

x) Which one of the following relations imply De Morgan's laws ?

i) $(A \cup B)' = A' \cap B'$

ii) $A \Delta B = (A - B) \cup (B - A)$

iii) $(A \cap B)' = A' \cup B'$

iv) $|(A \cup B)| = |A| + |B| - |A \cap B|$.

a) i b) ii and iv

c) iii d) i and iii.

xi) Two-phase locking protocol suffers from

a) Starvation b) Cascading roll back

c) Deadlock d) none of these.

xii) The relation $R - (A, B, C, D)$ and set of FDs are $F = (A \rightarrow B, C \rightarrow D)$. R is decomposed in two relations $R1 = (A, B)$, $R2 = (C, D)$. This is

a) Lossless join decomposition

b) Dependency preserving

c) both A and B

d) none of these.

Turn over

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Consider the following schedule :

T1	T2	T3
Read (A)		
	Read(B)	Read(C)
	Write(B)	Write(C)
Write(A)		
	Read(A)	
Read(C)		
	Write(A)	
Write(A)		

Is the above schedule conflict serializable ? Justify the answer.

3. What is the difference between Cartesian product, Natural join and outer join (left, right, full) ? Illustrate using suitable examples. 1 + 1 + 1 + 1 + 1

4. Describe three layer architecture of DBMS. Explain physical and logical data independence. 2 + 3

5. Let $R = (J, K, L)$ be a relation scheme with the following dependencies :

$F = \{JK \rightarrow L, L \rightarrow K\}$

a) Which are the candidate keys for R ?

b) Find $L+$

c) Find whether $J \rightarrow K$ holds or not ? 2 + 1 + 2

6. For a relation schema $R = \{A, B, C, D, E, F, G, H, I, J\}$ & set of FDs $F = \{ABD \rightarrow E, AB \rightarrow G, B \rightarrow F, C \rightarrow J, CJ \rightarrow I, G \rightarrow H\}$, find irreducible set of functional dependency.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Write SQL queries for the following, using relation schemas EMP : (Emp id, Ename, Mgr, Hiredate, Job, Sal, Dept id) and DEPT : (Dept id, Dname, Dloc). Mgr references 'Emp id' in EMP table and Dept id in EMP references Dept id in DEPT.

   i) List the number of emps working each 'MGR'.

   ii) List the Emp id, Ename, Sal, Dname of all the 'HR' and 'ANALYST' working in Mumbai, Kolkata with an experience more than 7 years and having twelve characters starting with 'S' and ending with 'H' in their Ename and asc order of Loc.

   iii) Display the details of the highest paid employee of 'SALES' dept.

   iv) Select Emp id with Ename as 'ASMITHA' and job as 'ANALYST' using Relational Algebra.

   b) What is view ? What do you mean by an updatable view ? Explain the conditions for a view to be updatable. $(2 + 2 + 2 + 2) + 7$

8. Write short notes from any *three* of the following : 3×5

   a) DBA and functions of DBA

   b) Lossless and lossy decomposition

   c) Query optimization

   d) Wait-die and Wound-wait technique of deadlock prevention

   e) BCNF.

9. a) Draw ER diagram for a hospital with a set of patients and doctors.
   b) Explain the terms 'specialization' and 'aggregation' with examples. 8 + 7

10. a) Show an example of deadlock with 2PL protocol.
    b) Explain *wait_die* and *wound_wait* approach of deadlock prevention. Are both the approaches starvation free ?
    c) What is a trigger ? How does it differ from ordinary stored procedure ? 3 + 9 + 3

11. a) What is transaction and what are ACID properties ?
    b) Create a B+ tree of order 3 with the plowing key values :
    {8, 5, 4, 7, 3, 12, 9, 16}
    Now delete {5, 12} and then insert {10}.
    5 + (6 + 4)

12. a) State some major transaction problems and explain any two of those problems with suitable example. 5
    b) Consider tree transactions : T1, T2 and T3. Draw a precedence graph for the following schedule and also determine whether the given schedule is serializable or not. If so, give its serial order(s). 5

Time	T1	T2	T3
t1			read(Y)
t2			read(Z)
t3	read(X)		
t4	write(X)		
t5			write(Y)
t6			write(Z)
t7		read(Z)	
t8	read(Y)		
t9	write(Y)		
t10		read(Y)	
t11		write(Y)	
t12		read(X)	
t13		write(X)	

c) Analyze what happens if the following two concurrency control mechanisms (in isolation) are enforced for the following schedule that consists three numerous transactions.

i) Basic time stamp ordering protocol (BTSO) and

ii) Thomas Write Rule Timestamp Ordering Protocol (TWRTSO). 2 + 3

10	20	30
T1	T2	T3
R(A)		
		W(A)
		R(B)
	W(A)	
W(B)		