



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : EE-604B**

**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) In the relational modes, cardinality is termed as
- a) number of tuples
  - b) number of attributes
  - c) number of tables
  - d) number of constraints.
- ii) Which if the following is not the type of data integrity ?
- a) Key integrity
  - b) Domain integrity
  - c) Entity integrity
  - d) Referential integrity.

- iii) The ability to modify the internal schema without causing any change to external schema is
- a) physical data independence
  - b) logical data independence
  - c) external data independence
  - d) none of these.
- iv) Which of the following is/are the DDL statements ?
- a) Create
  - b) Drop
  - c) Alter
  - d) All of these.
- v) In case of entity integrity, the primary key may be
- a) not Null
  - b) Null
  - c) both Null & not Null
  - d) of any value.
- vi) The concurrency control has the problem of
- a) lost updates
  - b) dirty read
  - c) unrepeatable read
  - d) all of these.
- vii) Advantage of locking algorithms in concurrent execution of database transaction is
- a) Deadlock
  - b) Concurrency
  - c) Consistency
  - d) none of these.

viii) The relation  $R = (A, B, C)$  and set of FDs are :

$F = \{A \rightarrow B, B \rightarrow C\}$ .  $R$  is decomposed in two different ways  $R_1 = (A, B)$ ,  $R_2 = (B, C)$ . This is

- a) Lossless join decomposition
- b) Dependency preserving
- c) both (a) and (b)
- d) none of these.

ix) Database ....., which is the logical design of the database, and the database ....., which is a snapshot of the data in the database at a given instant of time.

- a) Instance, Schema      b) Relation, Schema
- c) Relation, Domain      d) Schema, Instance.

x) The information about data in a database is called

- a) hyper data              b) tera data
- c) meta data              d) none of these.

xi) For a B-tree of order  $N$  with  $n$  nodes is of height

- a)  $\log 2n$                   b)  $\log_2 n$
- c)  $2 \log_2 n$               d)  $\log_2 n^2$ .

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### GROUP - B

#### ( Short Answer Type Questions )

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

2. How does tuple relational calculus differ from domain relational calculus ? Discuss the meaning of the existential quantifier ( $\exists$ ) and the universal quantifier ( $\forall$ ). 2 + 3

3. Explain the distinctions among the terms primary key, candidate key, alternate key and composite key. List four significant differences between a file-processing system and a DBMS. 2 + 3

4. What is trigger ? What are different types of trigger ? 2 + 3

5. Find out the closure of attribute set  $(AG)$  i.e.  $(AG)^+$  in the  $R$ .

Set of FDs  $F$  are as given below :

$R = \{A, B, C, G, H, I\}$

$F = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow H\}$  is  $(AG)$  is a super key of  $R$ .

6. Explain Left Outer Join, Right Outer Join and Full Outer Join.

**GROUP – C**

**( Long Answer Type Questions )**

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

7. a) Anushka has a large DVD movie collection. Her friends like to borrow her DVD's, and she needs a way to keep track of who has what. She maintains a list of friends, identified by unique FIDs (friend identifiers) and a list of DVDs, identified by DVDIDs (DVD identifiers). With each friend is the name and the all important telephone numbers which she can call to get the DVD back. With each DVD is the star actor name and title. Whenever a friend borrows a DVD, Anushka will enter that fact into her database along with the date borrowed. Whenever the DVD gets returned, that fact, too, gets noted along with the date returned. Anushka wants to keep a complete history of her friends' borrowing habits so that she can ask favours of the heavy borrowers (or perhaps refuse to make further loans to those who habitually don't return them quickly). Make an ERD required for the above.

- b) Why do we need Query Optimization ?
- c) Consider relation R (A, B, C, D, E) with the set of  $f = \{A \rightarrow C, B \rightarrow C, C \rightarrow D, DC \rightarrow C, CE \rightarrow A\}$ . Suppose the relation has been decomposed by relations  $R_1 (A, D)$ ,  $R_2 (A, B)$ ,  $R_3 (B, E)$ ,  $R_4 (C, D, E)$ ,  $R_5 (A, E)$ . Is this decomposition lossless or lossy ? Justify your answer.  $7 + 2 + 6$
8. a) What is blocking factor ? Explain the difference between B-tree and B+ tree indexing with proper example. 5
- b) Explain ACID properties of a transaction in database management system. 5
- c) Why commit and rollback statements are important in SQL ? 5
9. a) What are different types of locks.
- b) Discuss in brief the two phase locking protocol and discuss the implications of a failure on the part of
- i) the coordinator
- ii) a participant, during each of the two phases.

- c) Let T1, T2 and T3 be transactions that operate on the same data item A, B and C. Let r1 (A) means that T1 read A, w1 (A) means T1 writes A and so on for T2 and T3. Consider the following schedule and comment whether it is a serializable schedule or not.

S1 : r2(C), r2(B), w2(B), r3(B), r3(C), r1(A), w1 (A), w3(B), w3(C), r2(A), r1(B), w1(B), w2(A).

- d) What is shadow copy ? 2 + 6 + 5 + 2

10. Consider the following tables :

Loan : {cust\_id, name, amount}

Deposit : {cust\_id, name, branch, balance}

- a) Represent the following using relational algebra :
- Names of customers having both loan & deposit accounts.
  - Names of customers having loan account, but no deposit account.
- b) Using Loan and deposit schema specified above, write SQL statement to find the names of customers having deposit account in 'XYZ' branch having balance > Rs. 7500.
- c) What is Normalization ?
- d) Explain with an example of each 1NF, 2NF and 3NF. 2 + 2 + 3 + 2 + 6

11. Write short notes on any *three* of the following : 3 × 5

- Transaction state
  - Database Architecture
  - Recoverability of transactions
  - Armstrong's Axioms.
  - Multilevel Index.
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