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Paper Code : CS-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 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 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.

iii) The strategy for processing a query is improved by
   a) query evaluation
   b) decomposition
   c) query optimization
   d) none of these.

iv) Cartesian product in relational algebra is
   a) a unary operator
   b) a binary operator
   c) a ternary operator
   d) not defined.

v) Transitive dependency is removed in
   a) 1NF b) 2NF
   c) 3NF d) 4NF.

vi) Relational algebra is
   a) procedural
   b) non-procedural
   c) object oriented
   d) none of these.

vii) In 2-plase locking a transaction must
   a) release all its locks at the same time
   b) not obtain any new locks once it has started releasing locks
   c) obtain locks on items not used by any other transaction
   d) ensure that deadlocks will never occur.

viii) DML is provided for

a) description of logical structure of database

b) addition of new structures in the database system

c) manipulation & processing of database

d) definition of physical structure of database system.

ix) Which of the following protocols ensures conflict serializability and safety from deadlocks ?

a) Two-phase locking protocol

b) Time stamp ordering protocol

c) Graph based protocol

d) None of these.

x) Which one of the following is not an indexing technique ?

a) Primary index

b) Secondary index

c) Multilevel index

d) Sequential index.

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GROUP – B

(Short Answer Type Questions)

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

2. a) What is referential integrity ?

   b) Explain with example the difference between strong and weak entity sets. 2 + 3

3. Define schedule and conflict serializable schedule. 2 + 3

4. Explain with example super key, candidate key and primary key.

5. Define BCNF. How does it differ from 3NF ? Why is it considered a stronger than 3 NF ?

6. What is the main difference between two-phase locking and the time stamping technique concurrency control ? Explain briefly.

GROUP – C

(Long Answer Type Questions)

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

7. a) What is mapping constraint ? Describe three-layer architecture of DBMS.

   b) Draw the ER diagram for the system given as follows :

   An organization has number of faculties who are expert in one or more subjects. For each subject, number of such experts are there, system will store

faculty and subject information and must support query on finding expertise on subjects. Students get enrolled to have training on one or more subjects. System will keep student's information also. One faculty is allotted to teach one or more subjects. For one subject only one faculty is assigned. System must keep the information regarding such assignment. (2 + 6) + 7

8. a) What is transaction ?

b) What is ACID property ?

c) Explain with example serial and serializable schedule.

d) What are the problems of concurrent execution of transaction ?

e) Explain with the help of precedence graph the conflict and non-conflict serilizability.

1 + 3 + 4 + 3 + 4

9. a) Explain the terms 'full functional dependency' and 'multivalued dependency' with example.

b) Differentiate between 2NF and 3NF. What is lossless decomposition ?

c) What is closure ? Explain with example.

d) What do you mean by integrity constraint ?

4 + (3 + 2) + 4 + 2

10. a) State two-phase commit protocol and discuss the implications of a failure on the part of the coordinator, a participant, during each of the two phases.

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

c) Define three concurrency problems :

dirty read, non-repeatable read, phantoms.

d) Let T_1 , T_2 and T_3 be transactions that operate on the same data items A, B and C. Let r_1 (A) means that T_1 reads A, w_1 (A) means that T_1 writes A and so on for T_2 and T_3.

Consider the following schedule :

$S_1 : r_2(c),\ r_2(B),\ w_2(b),\ r_3(B),\ r_3(C),\ r_1(A),\ w_1(A),$

$w_3(B),\ w_3(C),\ r_2(A),\ r_1(B),\ w_1(B),\ w_2(A)$

Is the schedule serializable ?

e) What are the roles of Analysis, Redo and Undo phases in the recovery algorithm 'ARIES' ?

4 + 2 + 3 + 3 + 3

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

a) Two-phase Locking protocol

b) Dead lock

c) Transaction state diagram

d) *B*-tree

e) Data Dictionary.