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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 the following : 10 × 1 = 10

i) Relational calculus is a
   a) procedural language
   b) non-procedural language
   c) structured query language
   d) none of these.

ii) Cardinality ratio means
   a) Number of attributes associated with an entity
   b) Number of relations of an entity relationship diagram
   c) Number of entities to which another entity can be associated via relationship set
   d) None of these.

iii) A normal form in which every determinant is a key is
   a) 2NF b) 3NF
   c) BCNF d) 4NF.

iv) The entity integrity constraint states that
   a) No primary key value can be null
   b) A part of the key may be null
   c) Duplicate object values are allowed
   d) None of these.

v) In a relational data model, the columns of a model are called
   a) Relation b) Tuple
   c) Attribute d) Degree.

vi) Consider the schema R $(ABCD)$ and functional dependencies $A \rightarrow B$, $C \rightarrow D$. Then the decomposition of R into $R_1(AB)$ and $R_2(CD)$ is
   a) Dependency preserving and lossless join
   b) Lossless join but not dependency preserving
   c) Dependency preserving but not lossless join
   d) Not dependency preserving not lossless join.

vii) SELECT operation in SQL is a
   a) Data query language
   b) Data definition language
   c) Data manipulation language
   d) Data control language.

viii) The information about data in a database is called

a) Meta data b) Tera data

c) Hyper data d) none of these.

ix) A relation is considered to be in second normal form if it is in first normal form and it has no ..... dependencies.

a) Referential b) Functional

c) Partial key d) Transitive.

x) One difference between TRUNCATE and DELETE command in SQL is

a) TRUNCATE deletes the table but DELETE only deletes the record

b) DELETE operation can be rolled back, but TRUNCATE operation cannot be rolled back

c) TRUNCATE can be rolled back but DELETE cannot be rolled back

d) TRUNCATE is a DML command but DELETE is a DDL command.

GROUP – B

(Short Answer Type Questions)

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

2. What is lossless decomposition ? Explain with example.

3. Discuss the entity integrity and referential integrity constraints. Why each is considered important ? Explain with suitable example. 3 + 2

4. What is two phase locking ? How does it guarantee serializability. 3 + 2

5. Compute the closure of the following set F of functional dependencies for relation schema :

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

$A \rightarrow BC,\ CD \rightarrow E,\ B \rightarrow D,\ E \rightarrow A$

List the candidate keys for R. 4 + 1

6. Explain DDL, DML, DCL and TCL.

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain the roles of a database administrator (DBA).

b) Write a query for foreign key on delete cascade using alter command.

c) What is aggregation ? Discuss with an example.

d) Draw a functional dependency diagram (FD diagram) that is in 3 NF but not in BCNF.

Decompose that FD diagram into BCNF. 5 + 4 + 3 + 3

8. a) Draw an *E-R* diagram for the following :

A departmental store operates in several cities. In a city there is one headquarter coordinating the local operations. A city may have several stores. Stores hold any amount of items. Customers place their orders for any number of items to a given store.

b) Why we need query three level architecture of a DBMS ? Justify your answer with suitable example.

c) Consider the 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 the relations

$R1$ (A, D) $R2$ (A, B) $R3$ (B, E) $R4$ (C, D, E), $R5$ (A, E). Is this decomposition lossy or lossless ? Justify your answer. 7 + 2 + 6

9. a) List two reasons why "NULL" values may be introduced into databases ?

b) Consider the following relations and write queries in SQL :

Flights (flno, from, to, distance, departs, arrives, price)

Aircraft (aid, aname, cruising_range)

Certified (eid, aid)

Employees (eid, ename, salary)

(i) Identify the flights that can be piloted by every pilot whose salary is more than 70,000.

(ii) Find the eid's of employees who have the second highest salary.

(iii) Print the names and salary of every non-pilot whose salary is more than the average salary for pilots.

(iv) For all aircrafts with cruising-range over 1000 kms, find the name of the aircraft and the average salary of all pilots certified for this aircraft.

(v) Find the names of pilots who can operate planes with a range greater than 3000 kms but are not certified on any Boeing Aircraft.

c) Explain with example derived attribute and composite attribute . 2 + 10 + 3

10. a) State the two-phase commit protocol and discuss the implications of a failure on the part of

(i) Coordinator

(ii) A participant, during each of the two-phases.

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

c) Define three concurrency problems : dirty read, non-repeatable read, phantom read.

d) Let $T1$, $T2$, $T3$ be transactions that operate on the same data items A, B and C. Let $r1$ (A) mean that

$T1$ reads A. $w1$ (A) means that $T1$ writes A and so on for $T2$ and $T3$. Consider the following schedule 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). Is the schedule serializable ?

c) Explain the difference between B tree and $B+$ tree indexing with proper example. What is blocking factor ? 4 + 2 + 3 + 3 + 3

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

a) Data dictionary

b) Disadvantage of file based system

c) 4NF

d) Deferred update techniques

e) Database triggers.

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