Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CT)(N)/SEM-5/CT-504B/2012-13

2012

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) 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 E-R diagram

      c) number of entities to which another entity can be associated via relationship set

      d) none of these.

iii) The entity integrity constraint states that

a) no primary key can be null

b) a part of the key can be null

c) duplicate object values are allowed

d) none of these.

iv) Overall logical structure of a database can be expressed graphically using

a) ER diagram b) records

c) relation d) hierarchy.

v) A normal form in which every determinant is a key, is

a) 2NF b) 3NF

c) BCNF d) 4NF.

vi) Which of the following levels of abstraction involves the view of data ?

a) Physical level b) Logical level

c) View level d) None of these.

vii) The ability to change the internal schema without changing the external schema is known as

a) physical data independence

b) logical data independence

c) external data independence

d) none of these.

viii) The information about data in a database is called

a) meta data b) tera data

c) micro data d) none of these.

ix) A relation is said to be in 2NF if it is in 1NF and has no

a) transitive

b) partial key

c) referential

d) functional dependencies.

x) What is the smallest unit of data in a relational model ?

a) Data type b) Field

c) Data value d) None of these.

GROUP – B
(Short Answer Type Questions)

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

2. What is 2-phase locking ? How does it guarantee serializability ?

3. Find the closure of F for the following relation schema :

   $R = \{ A, B, C, D, E \}$

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

   Find the candidate key of R.

4. What are the ACID properties of a database transaction ? How are they selected to the concurrency control ? 3 + 2

5. What do you mean by functional dependency ? What are its main characteristics ? 2 + 3

6. What are the types of generalization ?

GROUP – C
(Long Answer Type Questions)

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

7. a) Explain the role of a DBA.

   b) What is aggregation ? Explain with diagram.

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

   d) Write a row trigger (in SQL) to insert the existing values of the table SALARY (employee_no, basic_salary, commission, deduction, department) into a table named OLDINFO when the SALARY table is updated.

   5 + 4 + 3 + 3

8. a) Explain the following terms :

'fully functional dependency' and 'non-transitive dependency' with examples.

b) Use the definition of functional dependency to argue that each of Armstrong's axioms (reflexivity, augmentation, transitivity, union and decomposition) is sound.

c) For a given Relvar $R = \{ A, B, C, D, E, F, G, H, I, J \}$ and set of functional dependencies $F = \{ ABD \rightarrow E, AB \rightarrow G, B \rightarrow F, C \rightarrow J, CJ \rightarrow I, G \rightarrow H \}$, find the irreducible set and candidate keys.

d) Suppose you are given a relation R with four attributes, $ABCD$. For each of the following sets of FD's assuming those are the only dependencies that hold for R, do the following :

i) Identify the candidate key(s) for R.

ii) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, BCNF).

iii) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

v) $C \rightarrow D, C \rightarrow A, B \rightarrow C$

w) $B \rightarrow C, D \rightarrow A$

x) $ABC \rightarrow D, D \rightarrow A$

y) $A \rightarrow B, BC \rightarrow D, A \rightarrow C$

z) $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B.$ 4 + 4 + 4 + 3

9. a) Compute the closure of the following set F of functional dependencies for relational schema.

$R = \{ A, B, C, D, E \}$

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

b) Consider the relation $R = \{ A, B, C, D, E, F, G, H, I, J \}$ and the set of functional dependencies :

$F = \{ AB \rightarrow C,\ A \rightarrow DE,\ B \rightarrow F,\ F \rightarrow GH,\ D \rightarrow IJ \}$

Decompose R into 3NF.

c) What do you mean by lossless and dependency preserving decomposition ?

d) What is MDV ? Explain with an example. 3 + 5 + 4 + 3

10. a) Consider the relation schemas given below :

STUDENT (student_id, name)

ENROLLEDIN (student_id, subject_code)

SUBJECTS (subject_code, lecturer)

Write relational algebra for the following :

i) Who teaches CP1500 or CP3020

ii) Who teaches at least two different subjects ?

iii) What are the names of the students taking a subject taught by Roger ?

b) Write down the differences between DBMS and Traditional File Processing System.

c) Describe ACID properties in DBMS.

d) Give an example of derived attribute.

(2 + 2 + 2) + 3 + 4 + 2

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

a) Vertical and Horizontal Fragmentation

b) Armstrong's axioms

c) Two-phase locking protocol

d) Conflict serializability

e) Theta (θ) join.

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