

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0111

Roll No.

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B.Tech.

(SEMESTER-IV) THEORY EXAMINATION 2012-13

DATABASE MANAGEMENT SYSTEMS

Time : 3 Hours]

[Total Marks : 100

SECTION – A

1. Attempt all parts :

10 × 2 = 20

- Explain the underlying concept of : Specialization and Generalization.
- Give example of a simple, composite, single-valued and multi-valued attributes of an entity.
- Differentiate between Data Definition Language and Data Manipulation Language.
- Express Natural Join and Division operator in terms of basic relational algebra operations.
- State and compare 3NF and BCNF.
- Verify the statement "A relation in 4NF is also in BCNF".
- Determine whether the following schedule is conflict serializable or not.
T1 : R(X), T2:R(X), T1:W(X), T2:R(Y), T3:R(Z), T2:W(Z), T3:W(X), T3:W(Y), T2:W(Y), T3:W(Z)
- Briefly describe cascadeless schedule.
- Define multi-version scheme.
- What are the pitfalls of lock based protocol ?



SECTION – B

3 × 10 = 30

2. Attempt any **three** parts :

(a) Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. Map your E-R diagram to relational model.

(b) For the following relational schema :

Employee (EmpId, EmpName, Street, City)

Works (EmpId, CompId, Salary)

Company (CompId, CompName, City)

Give an expression in SQL for each of the following queries :

(i) Find the names of employees whose salary is more than the average salary of all employees of their company.

(ii) Find the names of companies that has the largest number of employees.

(iii) Find names of employees whose salary is more than that of every employee of company named 'ABCD'.

(iv) Find names of companies located in the city in which company 'ABCD' is located.

(v) Give all employees a 20 percent raise in salary whose city is different from the city they work in.

(c) Find 3NF decomposition of the relation scheme, $R = \{\text{Faculty, Dean, Dept, Chairperson, Professor, Rank, Student}\}$ with the set of functional dependencies,

$F = \{\text{Faculty} \rightarrow \text{Dean}$

$\text{Department} \rightarrow \text{Chairperson}$

$\text{Professor} \rightarrow \text{Rank, Chairperson}$

$\text{Department} \rightarrow \text{Faculty}$

$\text{Student} \rightarrow \text{Department, Faculty, Dean}$

$\text{Dean} \rightarrow \text{Faculty}$

$\text{Professor, Rank} \rightarrow \text{Department, Faculty}\}$

(d) Discuss how the log file is a fundamental feature in any recovery mechanism. Explain what is meant by forward and backward recovery and describe how the log file is used in forward and backward recovery. What is the significance of the write-ahead log protocol ? How do check points affect the recovery protocol ?

(e) What is time stamp ? What is the need of time stamping protocol ? Explain how timestamp ordering protocol works.

SECTION – C

Attempt **all** parts :

5 × 10 = 50

3. Attempt any **two** parts :

- (a) Explain the difference between external, internal and conceptual schemas. How these different layers are related to the concepts of logical and physical and physical data independence ?
- (b) What are the differences between the terms : CANDIDATE KEY, PRIMARY KEY, SUPER KEY and COMPOSITE KEY ?
- (c) Describe advantages and disadvantages of database management system over file-processing system.

4. Attempt any **two** parts :

(a) Describe the following integrity constraints using suitable examples :

- (i) Entity
- (ii) Referential integrity

(b) Given the following relations :

Vehicle (reg_no, make, colour)

Person (eno, name, address)

Owner (eno, reg_no)

Write expressions in relational algebra to answer the following queries :

- (i) List the names of persons who do not own any car.
 - (ii) List the names of persons who own only Maruti Cars.
- (c) Explain the purpose of triggers in SQL with the help of an example.

5. Attempt any **two** parts :

(a) Suppose we have a relation ABCD with some FD's F as follows :

$$F = AB \rightarrow C, C \rightarrow D, D \rightarrow A$$

Compute closures A^+ , C^+ , $(AB)^+$, $(AC)^+$ and all FD's (functional dependencies) that follow from F.

(b) What are the three data anomalies that are likely to occur as a result of data redundancy ? Can data redundancy be completely eliminated in database approach ? Why or why not ?

(c) List the Armstrong's axioms for functional dependencies. What do you understand by soundness and completeness of these axioms ?

6. Attempt any **two** parts :

(a) What do you mean by heterogeneous distributed databases ? Describe some of the important issues that need to be addressed by the Heterogeneous Distributed Database Systems.

(b) Describe in brief the recovery techniques based on immediate update.

(c) State the conditions for the two schedules to be equivalent. Define a serializable schedule.

7. Attempt any **two** parts :

(a) Explain multiple-granularity locking. In multiple-granularity locking, what are the differences between implicit and explicit locking ?

(b) Describe major problems associated with concurrent processing with examples. What is the role of locks in avoiding these problems ?

(c) Explain in brief working of two-phase locking protocol. Explain with the help of example of a schedule, how this protocol ensures a schedule to be conflict-serializable, but not cascade-less.