



Printed Pages : 4

TCS - 402

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

**PAPER ID : 1068**

Roll No.

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## B. Tech.

(SEM. IV) EXAMINATION, 2007-08

### DATA BASE MANAGEMENT SYSTEM

Time : 3 Hours]

[Total Marks : 100

- Notes :
- (1) Attempt *all* questions.
  - (2) *All* questions carry *equal* marks.

1 Attempt any **two** parts of the following :

- (a) Discuss the three level architecture of database system.
- (b) 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.
- (c)
  - (i) Differentiate between the weak and strong entity.
  - (ii) Define the concept of aggregation. Give two examples where this concept is useful.
  - (iii) Differentiate among the Primary key, Candidate key and Super key.



2 Attempt any **two** parts of the following :

(a) Suppose we decompose the schema  $R=(A,B,C,D,E)$  into :

$(A,B,C)$

$(C,D,E)$

Show that it is not a lossless decomposition.

(b) Define multi-valued dependencies. Explain the Fourth Normal Form algorithm to remove it.

(c) Use Armstrong's axioms to prove the soundness of the *union* rule.

3 Attempt any **two** parts of the following:

(a) Consider the database given below, where primary keys are underlined. Give an expression in relation algebra to express each of the following queries :

- (i) Find the names of all employees who live in the same city and on the same street as do their managers.
  - (ii) Find the names of all employees who do not work for State Bank.
  - (iii) Find the names of all employees who earn more than every employees of Punjab National Bank.
  - (iv) Modify the database so that Jones now lives in Mumbai.
  - (v) Give all managers a 10% salary raise.
- employee (person-name, street, city)  
works (person-name, company-name, salary)  
company (company-name, city)  
managers (person-name, manager-name)



(b) (i) Given the relation schemas  $R=(A,B,C)$  and  $S=(D,E,F)$  and relations  $r(R)$ ,  $s(S)$ . Give an expression in SQL to each of the following queries :

(1)  $\Pi_A(r)$

(2)  $\sigma_{B=17}(r)$

(3)  $r \times s$

(4)  $\Pi_{A,F}(\sigma_{C=D}(r \times s))$

(ii) Show that in SQL,  $\diamond$  **all** is identical to **not in**.

(c) Define the following terms :

(i) Referential integrity

(ii) Domain constraints

(iii) Keys constraints

(iv) Domain calculus.

4 Attempt any **two** parts of the following :

(a) Let transactions T1, T2 and T3 be defined to perform the following operations :

T1 : Add one to A

T2 : Double A

T3 : Display A on the screen and then set A to one (A is some item in database)

(i) Suppose T1, T2, T3 are allowed to execute concurrently. If A has initial value zero, how many possible correct results are there? Enumerate them.



- (ii) Suppose the internal structures of T1, T2, T3 is are indicated below. If the transactions execute *without* any locking, how many possible schedules are there ?

T1	T2	T3
<b>R1: RETRIEVE A</b> <b>INTO t1;</b> <b>t1 := t1 + 1;</b> <b>U1: UPDATE A</b> <b>FROM t1;</b>	<b>R1: RETRIEVE A</b> <b>INTO t2;</b> <b>t2 := t2*2;</b> <b>U1: UPDATE A</b> <b>FROM t2;</b>	<b>R3: RETRIEVE A</b> <b>INTO t3;</b> <b>display t3;</b> <b>U1: UPDATE A</b> <b>FROM 1;</b>

- (b) What is recoverable schedule ? Why is recoverability of schedules desirable ? Are there any circumstances under which it would be desirable to allow non-recoverable schedules ? Explain your answer.
- (c) Discuss the procedure of deadlock detection and recovery in transactions.

5 Attempt any **two** parts of the following :

- (a) Discuss the working of *multiple granularity* scheme in concurrency control.
- (b) Explain the working of locking technique in concurrency control. What benefit does rigorous two-phase locking provide ? How does it compare with other forms of two-phase locking ?
- (c) State the working of multi-version timestamp based protocol. Suggest a scheme to avoid the phantom phenomenon.

