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 (<u>person-name</u>, street, city)

works (<u>person-name</u>, company-name, salary)

company (<u>company-name</u>, city)

managers (<u>person-name</u>, 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) $\Pi_{A, F} \left(\sigma_{C=D} (r \times s) \right)$

(ii) Show that in SQL, $\Leftrightarrow$ **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
R1 : RETRIEVE A INTO t1;	R1 : RETRIEVE A INTO t2;	R3 : RETRIEVE A INTO t3;
t1 := t1 +1;	t2 := t2*2;	display t3;
U1 : UPDATE A FROM t1;	U1 : UPDATE A FROM t2;	U1 : UPDATE A FROM 1;

(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.