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Indian Institute of Engineering Science and Technology, Shibpur  
B.E.(CST) 6<sup>th</sup> Semester Examination, 2015  
Database Management Systems (CS 601)  
Answer any five questions

F.M. 70

Time: 3 hrs

1. (a) What are the importance of view? Discuss the problem that may arise when one attempts to update database through view.

(b) Relation R(A,B) has the following view on it:

CREATE VIEW V AS (SELECT R1.A,R2.B FROM R R1, R R2 WHERE R1.B = R2.A);

i) The current contents of relation R are shown below. What are the contents of the view V?

A	B
1	2
2	3
2	4
4	5
6	7
6	8
9	10

ii) The rows (2,11) and (11,6) are now inserted in R. What are the additional rows that are inserted in V?

(c) Define recursive relationship.

[(3 + 4) + 5 + 2]

2. (a) Define third normal form (3NF) and Boyce-Codd normal form (BCNF).

(b) When are two sets of functional dependencies equivalent? There are two sets of FDs for a relation R(A, B, C, D, E) as given below:

i)  $A \rightarrow B$                        $AB \rightarrow C$                        $D \rightarrow AC$                        $D \rightarrow E$

ii)  $A \rightarrow BC$                        $D \rightarrow AE$

Are they equivalent?

(c) Consider the relation schema R(A, B, C) with FDs  $AB \rightarrow C$  and  $C \rightarrow A$ . Show that the schema R is 3NF but not in BCNF.

[3 + (2 + 5) + 4]

3. (a) What are the differences between primary and secondary indexes? How many clustering indexes and secondary indexes can have on a file?

(b) Draw a node structure of  $B^+$  - tree. Suppose the search field is  $V = 9$  bytes long, the disk block size  $B = 512$  bytes, a record pointer is  $P_r = 7$  bytes and a block pointer is  $P = 6$  bytes. Find the maximum number of tree pointer ( $p$ ) that a internal node has and also the find the maximum number of record pointer that a leaf node has.

(c) what is meant by physical data independence?

[(4 + 1) + (2 + 5) + 2]

4. (a) Discuss the ACID properties of a database transaction.

(b) Define serializable schedule. Let  $T_1$ ,  $T_2$  and  $T_3$  be the transactions that operate on the same data items  $X$ ,  $Y$ , and  $Z$ . Let  $r_1(X)$  means that  $T_1$  reads  $X$ ,  $w_1(X)$  means that  $T_1$  writes  $X$  and so on for  $T_2$  and  $T_3$ . The schedule  $S_1$  is given below:

$S_1: r_2(Z); r_2(Y); w_2(Y); r_3(Y); r_3(Z); r_1(X); w_1(X); w_3(Y); w_3(Z); r_2(X); r_1(Y); w_1(Y); w_2(X).$

Draw a precedence graph for  $S_1$  and state whether the schedule is serializable or not. If the schedule is serializable, then write down an equivalent serial schedule. [5 + 9]

5. (a) What is meant by database recovery? Discuss the *deferred update protocol* for database recovery. Explain the purpose of checkpoint mechanism.

(b) Discuss the *timestamp ordering protocol* for concurrency control. [(2 + 5 + 3) + 4]

6. (a) A University placement centre maintains a relational database of companies that interview students on campus and makes job offer to those successful in the interview. The database is given below:

COMPANY (cname, clocation)

STUDENT (srollno, sname, sdegree)

INTERVIEW (cname, srollno, idate)

OFFER (cname, srollno, osalary)

(i) Write relational algebra expression for the following query:

List the roll number and name of those students who appeared at least one interview but did not receive any job offer.

(ii) Write an SQL query to list, for each degree program in which more than five students were offered jobs, then name of the degree and average offered salary of students in the degree program.

(b) Discuss insertion, deletion and modification anomalies with an example. [6 + 8]

7. a) Construct an E-R diagram for a hospital with a set of patients and set of doctors. Associate with each patient a log of the various tests and examinations conducted.

b) What is the difference between a specialization and generalization? Define derived attribute. [8 + (4 + 2)]

8. Write short notes on the following: [7 + 7]

(i) Two-phase protocol for concurrency control.

(ii) Database security.