E/S 14-12-16

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CSE201 Enrol. No. .....
[ET]

END SEMESTER EXAMINATION : NOV.-DEC., 2016

DATABASE MANAGEMENT SYSTEMS

Time : 3 Hrs. *Maximum Mars : 70*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (30 Marks)

Attempt any **five** *questions out of* **six.**
Each question carries **06** *marks.*

1. Discuss the main characteristics of the database approach and how it differs from traditional file systems.

2. Let the following relation schemas be given : R = (A, B, C) S = (D, E, F). Let relations r(R) and s(S) be given. Give an expression in the tuple relational calculus that is equivalent to each of the following :
   (a) $\Pi_A(r)$
   (b) $\sigma_{B=17}(r)$
   (c) $r \times s$
   (d) $\Pi_{A,F}\ (\sigma_C = D(r \times s))$

P.T.O.

3. Discuss the steps for implementing JOIN and UNION by using sort-merge algorithms.

4. Differentiate between following terns

   (a) Pipelining and materialization (3)

   (b) Wait die and wound wait protocols (3)

5. Give an algorithm to find the non-redundant cover. Find the minimal cover of following set of FDs $F = \{A \rightarrow BC, \quad CD \rightarrow E, \quad E \rightarrow C, \quad D \rightarrow AEH, ABH \rightarrow BD, \; DH \rightarrow BC\}$

6. Discuss horizontal and vertical fragmentation with the help of suitable examples.

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three**.
Each question carries **10** *marks.*

7. (a) Discuss the reasons for converting SQL queries into relational algebra queries before optimization is done. (5)

   (b) Draw the tree and explain how heuristic query optimization is performed on following query.

```
SELECT Lname
FROM EMPLOYEE, WORKS_ON, PROJECT
WHERE Pname='Aquarius' AND Pnumber=Pno
AND Essn=Ssn
AND Bdate > '1957-12-31';
```

(5)

8. Consider the following two transactions :

```
T31:read(A);
read(B);
if A = 0thenB:=B + 1;
write(B).

T32: read(B);
read(A);
if B = 0thenA:=A + 1;
write(A).
```

(a) Add lock and unlock instructions to transactions T31 and T32, so that they observe the two-phase locking protocol. (6)

(b) How can the execution of these transactions result in a deadlock ? (4)

P.T.O.

9. Consider the relation R, which has attributes that hold schedules of courses and sections at a university; R = {CourseNo, SecNo, OfferingDept, Credit-Hours,CourseLevel, InstructorSSN, Semester, Year, Days_Hours, RoomNo, NoOfStudents}. Suppose that the following functional dependencies hold on R:

{CourseNo} → {OfferingDept, CreditHours, CourseLevel}

{CourseNo, SecNo, Semester, Year} → {Days_Hours, RoomNo, NoOfStudents, InstructorSSN}

{RoomNo, DaysJHours, Semester, Year} → [Instructorssn, CourseNo, SecNo}

Dateraiine which sets of attributes form keys of R. How would you normalize this relation ?

SECTION – C (20 Marks)

(Compulsory)

10. (a) The company is organized into departments. Each department has a unique name, a unique numher, and a particular employee who manages the department. We keep track of the start date when that employee began managing the department. A department may have several locations. A department controls a number of projects, each of which has a unique name, a unique number, and a single location. We store each employee's name,

Social Security number, 2 address, salary, sex (gender), and birth date. An employee is assigned to one department, but may work on several projects, which are not necessarily controlled by the same department. We keep track of the current number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee (who is another employee). We want to keep track of the dependents of each employee for insurance purposes.We keep each dependent's first name, sex, birth date, and relationship to the employee. Design an ER diagram and Schema Diagram for the given situation state clearly if any assumption made. (10)

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

employee (person-name, street, city)

works (person-name, company-name, salary)

company (company-name, city)

manages (person-name, manager-name)

(i) Find the names of all employees in this database who live in the same city as the company for which they work.

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(ii) Find the names of all employees who live in the same city and on the same street as do their managers.

(iii) Find the names of all employees in this database who do not work for First Bank Corporation.

(iv) Find the names of all employees who earn more than every employee of Small Bank Corporation.

(v) Assume the companies may be located in several cities. Find all companies located in every city in which Small Bank Corporation is located. (10)