RAMAKRISHNA MISSION VIDYAMANDIRA
(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2019
THIRD YEAR [BATCH 2017-20]
Date   : 12/12/2019   **COMPUTER SCIENCE [Honours]**
Time   : 11 am – 1 pm   **Paper : V [Gr – A]**   Full Marks : 40

[All symbols have their usual meaning]

Answer **any four** questions from question **nos. 1 to 6:**   (4×10)

1. a) Let R = { ssn, ename, punmber, pname, plocation, hours } and R is decomposed into three

    Relations R1, R2, and R3 as follows;

    R1 = EMP = {ssn, ename}

    R2 = PROJ = {pnumber, pname, plocation}

    R3 = WORKS_ON = {ssn, pnumber, hours}

    Assume that the following functional dependencies are holding on relation R.

    F = {ssn $\rightarrow$ ename; pnumber $\rightarrow$ { pname, plocation}; {ssn, pnumber } $\rightarrow$ hours}.

    Find whether the decomposition into R1, R2, and R3 is lossless join decomposition or not.

    b) For a relation schema R = (A, B, C, D, E), consider the following set of functional
    dependencies;   F = {A $\rightarrow$ BC, CD $\rightarrow$ E, B $\rightarrow$ D, E $\rightarrow$ A}

    Using the functional dependencies computer the canonical cover F_c.   [5+5]

2   a) Consider a relation R (A, B, C, D, E) with FDs AB $\rightarrow$ C, AC $\rightarrow$ B, BC $\rightarrow$ A, D $\rightarrow$ E.

    Determine all the keys of relation R. Is the relation R in BCNF ? If it is not in BCNF then
    normalize it into BCNF.

    b) A relation R is defined as R = (name, street, city, state, postal_code) Here, name is unique,
    and for any given postal code, there is just one city and state.

    What are the candidate keys? Is R in 3NF? 2NF? Explain why? If R is not in 3NF, normalize
    it into 3NF relations.   [5+5]

3. a) What would be the problems with transactions without ACID properties ?

    b) Consider the relation R (ABCDEFGHIJ) and Functional dependency set F={AB $\rightarrow$ C, B $\rightarrow$ F,

    D $\rightarrow$ IJ, A $\rightarrow$ DE, F $\rightarrow$ GH} decomposed into

    D2 = R_1(ABCDE), R_2(BFGH), R_3(DIJ).

    Check whether the decomposition D is preserving dependency or not ?   [5+5]

4. a) Draw an Entity Relationship Diagram of Library Management System.

    b) What do you mean by domain relational calculus ?

    c) What do you mean by referential integrity ? Give example.   [5+2+3]

5. a) Briefly describe on conflict and view serializability.

   b) What are the differences between primary and secondary index ?   [6+4]

6. Consider the following Database Schema:

   employee (person-name, street, city)

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

   company (company-name, city)

   manages (person-name, manager-name)

   Write down the following SQL Queries :

   i)   Find the company with the most employees.

   ii) Find the company with the smallest payroll.

   iii) Find those companies whose employees earn a higher salary, on average, than the average salary at First Bank Corporation.

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

   v)   Assume that, the companies may be located in several cities. Find all companies located in every city in which Small Bank Corporation is located.   [2 × 5]

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