# B.Tech. Degree IV Semester Examination April 2017

## CS/IT 15-1406 DATABASE MANAGEMENT SYSTEMS
### (2015 Scheme)

Time: 3 Hours                                    Maximum Marks: 60

## PART A
### (Answer *ALL* questions)

(10 × 2 = 20)

I.  (a)  Differentiate between database intension and database extension.

(b)  Compare attribute and value set, with examples.

(c)  Explain the technique used to insert a new record in a sorted file.

(d)  Define blocking factor. Calculate the number of blocks required to store 100,000 records when the record size is 200 bytes and the block size is 1024 bytes. Assume that fixed length records are used.

(e)  From the below relations, write the SQL statement to list in alphabetic order all students in the physics department.
STUDENT (ID, name, deptName, totCred)

(f)  Determine the normal form of the relation.
Book (ISBN, Title, Publisher, Address)
Given the following dependencies:
ISBN → Title, ISBN → Publisher and Publisher → Address.

(g)  Describe lost update problem.

(h)  Define a binary lock. Write about the two operations associated with a binary lock.

(i)  Write SQL statement to give a raise to all instructors of 'Research' in the following table.
INSTRUCTOR (ID, name, deptName, salary).

(j)  Write the relational algebra to find the names of all instructors whose salary is greater than 5000 in the Biology department.
Use the relation INSTRUCTOR (ID, name, deptName, salary).

## PART B

(4 × 10 = 40)

II.  (a)  Differentiate between strong entity type and weak entity type, with examples.

(b)  A bank has many branches and a large number of customers. A customer can open different kinds of accounts with the bank. The bank keeps track of a customer by his SSN, name, address, age and phone number. There are different types of loans, each identified by a loan number. A customer can take out more than one type of loan and all branches can give loans. Loans have a duration and interest rate. The account holder can enquire about the balance in his account. Draw an ER diagram for the bank.

**OR**

III.   (a)   Define data independence. Define and describe the two types of data independence.

      (b)   Design a generalization-specialization hierarchy for patients in a hospital. A patient can be out-patient or a resident patient. Assume the attributes for each entity type. Justify your placement of attributes at each level of the hierarchy.

IV.   (a)   Among ordered file and unordered file, mention the file organization that takes less access time. Write the search algorithm used.

      (b)   The keys 2369, 3760, 4692, 4871, 5659, 1821, 1074, 7115, 1620, 2428, 3943, 4750, 6975, 4981 and 9208 are inserted into an initially empty hash table. Each bucket is one disk block and holds two records. Load these records into the file in the given order, using the hash function h(K) = K mod 10. Use linear probing to handle overflow. Write the resultant hash table.

<center>OR</center>

V.   (a)   Primary index or a clustering index is sparse. Comment on this.

      (b)   A file has r = 20,000 STUDENT records of fixed length. Each record has the following fields: Name (30 bytes), Ssn (9 bytes), Address (40 bytes), PHONE (10 bytes), Birth_date (8 bytes), Sex (1 byte), Major_dept_code (4 bytes), Minor_dept_code (4 bytes), Class_code (4 bytes, integer), and Degree_program (3 bytes). An additional byte is used as a deletion marker. The file is stored on the disk whose block size B = 512 bytes. Write appropriate formulas and calculate the record size R (including the deletion marker) in bytes, the blocking factor and the number of file blocks, assuming an unspanned organization. Calculate the average number of block accesses needed to search for an arbitrary record in the file, using linear search.

VI.   (a)   Differentiate between super key, candidate key, primary key, and foreign key with suitable examples.

      (b)   Consider the bank database.

Branch (branchName, branchCity, assets)
Customer (customerName, customerStreet, customerCity)
Loan (loanNumber, branchName, amount)
Borrower (customerName, loanNumber)
Account (accountNumber, branchName, balance)
Depositor (customerName, accountNumber)

Give an expression in the relational algebra for each of the following queries:

    (i)   Find all loan numbers with a loan value greater than ₹10,000.

    (ii)   Find the names of all depositords who have an account with a value greater than ₹6,000.

    (iii)   Find the names of all depositors who have an account with a value greater than ₹6,000 at the "Uptown" branch.

    (iv)   Find the names of all customers who have a loan and an account at bank.

    (v)   Find the names of all customers who have a loan at the "Cantonment" branch.

<center>OR</center>

VII.  (a)  Describe how BCNF differs from and is stronger than 3NF. Illustrate with examples.

    (b)  Consider the rational database.

Employee (person name, street, city)

Works (person name, company name, salary)

Company (company name, city)

Write the SQL statement for each of the following queries:

    (i)  Find the names of all employees who live in city "Kochi".

    (ii)  Find the names of all employees whose salary is greater than ₹10,000.

    (iii)  Find the names of all employees who live in "Kochi" and whose salary is greater than ₹100,000.

    (iv)  Find the names of all employees who work for "State Bank Corporation".

    (v)  Find the names and cities of residence of all employees who work for "State Bank Corporation".

VIII.  (a)  Using a state diagram, explain the states of transaction.

    (b)  For the following schedules, draw the precedence graph for each schedule, and determine whether each schedule is serializable or not.

S1: r1(X); r2(Z); r1(Z); r3(X); r3(Y); w1(X); w3(Y); r2(Y); w2(Z); w2(Y);

S2: r1(X); r2(Z); r3(X); r1(Z); r2(Y); r3(Y); w1(X); w2(Z); w3(Y); w2(Y);

**OR**

IX.  (a)  Discuss two phase locking protocol. Compare Basic, Conservative, Strict, and Rigorous Two-Phase Locking protocols.

    (b)  Explain log based recovery with deferred update and immediate update.

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