MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL
(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2019

SUBJECT: DATABASE SYSTEMS [ICT 3154]

REVISED CREDIT SYSTEM
(22/11/2019)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.
❖ Missing data may be suitable assumed.

1A. Consider the following Database Schema.
COURSE (course_no, description, cost, c_dept_name)
PRE_REQUISITE (course_no, prereq_course_no)
SECTION_COURSE (section_id, course_no, location, instructor_id, capacity)
ENROLLMENT (student_id, section_id, course_no, enroll_date, grade)
INSTRUCTOR (instructor_id, name, i_dept_name)

    i.   Get the count of the students for each section who have taken all the courses of that section using nested query in 'From' clause. (For example, if student 's1' and 's2' have taken all the courses offered by section 'sec1', then the output is 'sec1, 2').

    ii. Enforce the constraint "Each course must have at least two prerequisite courses" on the above database without using Trigger.   **5**

1B. With suitable example mention the shortcomings of Two-Phase Locking protocol.   **3**

1C. What is the significance of Cascade-less schedule?   **2**

2A. Explain in detail working of the Time-stamp based protocol. Also mention it's pros and cons.   **5**

2B. Write a function to display list of courses for an input department along with the number of students enrolled for each course. Consider the schema given in Q.No.: 1A.   **3**

2C. Explain with suitable example the Deferred and Immediate database modification recovery technique.   **2**

3A. Answer the following questions by considering database schema given in Q.No.: 1A.
    i.   Write a trigger to display instructor information along with the courses when number of courses he/she takes other than his/her department exceeds count 2.
    ii. List the students who scored 'F' grade in 50% of their enrolled courses.   **5**

3B. Consider following relation schema   **3**
EMPLOYEE (person name, street, city)

WORKS (person name, company name, salary)
COMPANY (company name, city)
Give an expression in the relational algebra(σ, Π, $\cup$, $\neg$, $\cap$, $\times$, $\bowtie$) to express each of the following queries:

i. Find the names of all employees who live in city "Delhi".
ii. Find the names of all employees whose salary is greater than 40000 INR.
iii. Find the names of all employees in the database who live in the same cities as the companies for which they work

3C. Mention all the workers behind the database system along with their operations.   **2**

4A. Consider a database that will store information about books for sale. Each book has an ISBN, title, price and short description. Each book is published by a publisher in a certain publishing year. For each publisher, the database maintains the name, address and phone number. Each book is written by one or more authors. For each author, the database maintains his/her ID, name and a short introduction. Each book is stored in exactly one warehouse with a particular quantity. For each warehouse, the database maintains the warehouse name, the location and the phone number. Each book has one or more sellers, which may be either companies (corporate vendors) or individuals (individual vendors). For each company, the database maintains a name of the company, its address, its phone numbers (there could be more than one phone number, each with a number and a description) and its contact person. For each individual vendor, the database keeps a name, a phone number and an email address. A contact person whose company sells a book cannot be selling the same book as an individual vendor at the same time (he/she may sell other books as an individual seller). Draw an ER-Diagram describing the above scenario. Make sure to indicate the various attributes of each entity, participation, cardinality, specialization/ generalization and relationship set along with the key for each entity. State any additional assumptions you make. Further reduce it to relation schema.   **5**

4B. For the given functional dependency sets F and G, check whether they are equivalent or not. If they are not equivalent, identify the functional dependency which violates their equivalence. F: {AB→C , D→E , E→C } and G: {AB→C , D→E , AB→E , E→C}.   **3**

4C. With the help of an example, differentiate between following concepts:
i. Disjoint and Overlapping constraints
ii. Total completeness and partial completeness constraints   **2**

5A. Considering the below set of functional dependencies for a relation R (A, B, C, D, E, F, G), F = {AD →BF, CD →EGC, BD → F, E → D, F → C, D → F}.
i. Find the minimal cover for the above set of functional dependencies.
ii. Using the functional dependencies that you computed in step (i), find the candidate keys for this relation and decompose it to keep it in ~~BCNF.~~ 3NF.
iii. Suppose we decompose the above relation into two relations: R1(A,B,C,D,E) R2(A,D,F,G) , using the functional dependencies in the minimal cover, determine if this decomposition is lossless or not.   **5**

5B. Illustrate in detail, how database approach differs from traditional file systems.   **3**

5C. Consider a relation R(X, Y, Z) with three tuples: (6, 4, 2), (6, 6, 8) and (6, 4, 8). Which of the following three functional dependencies do not hold for relation R? Explain your answer. Y → X, Z → Y, XY → Z.   **2**