BCSE 3rd Year 2nd Semester Examination, 2020-21

Database management Systems

Full marks: 70   **Time: 3 hours**

Instructions

- **Arrange the pages in sequence and form a single pdf.**

- **File name will be last two digits of your class roll followed by your first name. Additionally, for Lateral Entry students file name must start with L and for readmitted students file name must start with R.**

- **On the top of the first page write your Class Roll Number , Exam Roll Number (if available) and Name.**

- **Send the answer script at: sksjuexam@gmail.com**

- **In case of any query please call at 9433526300**

CO1   Understand the fundamental concepts of DBMS and relational model   [15]

1. a) Discuss on model based constraint in relational model.   2
    b) A tuple is to be deleted from a relation. It is also being referred by another
    relation. How the deletion can be accomplished?   2
    c) Comment on having a derived attribute in a relation.   3
                                       or
    a) Discuss on the utility of data dictionary.   2
    b) Comment on the atomicity of an attribute in a relation.   2
    c) Compare full outer join and full outer union.   2
    d) Comment on the commutativeness of projection operation in relational algebra. 1

2. Consider the following relations:
    **STUDENT (ROLL, NAME) , ASSIGNMENT (ASSIGN_ID, DT_OF_ISSUE),
    SUBMISSION(ROLL, ASSIGN_ID)**
    STUDENT contains list of all students, ASSIGNMENT contains list of all
    assignments and SUBMISSION contains data corresponding to the submission of
    assignments made by the students.
    a) Write down the **relational algebra** expression for the following: i) for each
        student find the assignment id(s) of the assignment(s) not submitted by him/her.
        ii) Find the name of the students who have submitted all the assignments.   2+2
    b) Write down the **relational calculus** expression to find out the name of the
        students who have submitted no assignment.   2

c) What is the relation between the two relational calculus expression: NOT($\exists$x)(P(x)) and ($\exists$x)(NOT P(x)). Explain your answer. 2

CO2 Represent the database using Entity-Relation Model and design the database [15]

3. a) Consider there exists one to one relationship between two entity types A and B. Discuss how the participation constraint influences the corresponding design of database. 5.5

   b) Compare shared subclass and category in EER diagram. 2.5

   or

   a) Each user has user-id, name and contact number. Disk is partitioned and each partition has partition id and address. User can access number of partitions and in a partition number of users can work. Draw the ERD. Take care so that one can find out last time of access for a partition and the same by a specific user. Also show the tables corresponding to the ERD. 6

   b) Explain the design of relations for generalization-specialization scenario having disjoint and total specialization. 2

4. Consider the following scenario: A teacher can teach multiple subjects. For a subject also there may be number of teachers capable of teaching. In a programme, number of subjects may be taught. There may exist common Subjects across the programmes. System must be able to provide information on the expertise of a teacher, teachers available for a subject, subjects in a program and also the actual allotment of the teacher for a subject in a programme. Draw the ERD and design the database. 7

CO3 Understand functional dependency and normalize the database [15]

5. a) Consider a schema to store the following information related to different projects in the university: Project_id (it is unique for each project), Project name, Start date, End date, Funded By, Fund Amount, Project Investigator information (consisting of, Emp_ID of the coordinator, Name, e-mail id), information for the co-investigators (for each co-investigator information like investigator is kept), and for each staff working in the project keep staff_id, staff name, Date of birth, Date of join and salary.
   Further assume the following FDs:
   Project_id$\rightarrow$ Project_Name, Start date, End date, Funded by, Fund Amount, Project Investigator
   Emp_Id$\rightarrow$ Name, e-mail id
   Staff_id$\rightarrow$ staff name, Date of Birth
   Project_id, staff_id$\rightarrow$ Date of join, Salary
   Normalize the scheme to avoid null value, redundancy and update anomalies. Show the steps. 8

   b) How will you define a functional dependency in a set as redundant one? 2

   c) MVD is a consequence of 1NF – explain. 3

   d) If A$\rightarrow$B and A$\rightarrow$C then show that A$\rightarrow$BC 2

CO4   Interact with database using SQL, PL/SQL, Trigger   [15]

6. a) Consider the following tables (no need to create, they exist):
    STUDENT(**ROLL**, NAME) contains list of all students
    SUBJECT(**SUB_CODE**, SUB_NAME, FULL_MARKS, PASS_MARKS) contains
    list of all subjects
    RESULT(**ROLL, SUB_CODE**, SCORE) contains entries provided the student
    appeared in the examination for the corresponding subject.
    Write down the SQL statement for the following:
    i)   For each student show the sub_code in which he/she did not appear in
            the examination.   3
    ii)   Find the name of the subjects in which nobody has failed (considering
            only those who have appeared in the exam).   3
    iii)   Find the name and total score for those students with total score more
            than 400. List must appear in the descending order of total score. 4

    b) Consider the tables described in question 6)a). Take the measure so that
        whenever an entry is made into RESULT table, if the score is less than pass
        marks in the corresponding subject then in BACKLOG table an entry will be
        made to store corresponding roll and sub_code.   5

**CO5   Conceptualize the principles of query optimization, transaction processing, concurrency
control, recovery   [10]**

7. a) Compare execution of queries based on binary search tree and B/B+tree.   2
    b) Discuss how will you handle SELECT and PROJECT operation to optimize the
    query.   3
     c) Write a concurrent schedule that will result into deadlock under two phase
     locking protocol. Now evaluate the same schedule under time stamp based protocol.
                                                                        5

                            or
    a) Two large relations are to be joined frequently. It is not possible to sort them on
    join attribute. What will you do to optimize the operation?   2
    b) Consider a DBMS follows steal/no force approach. It has adopted log based
    recovery. To ensure the durability and recovery what has to be done to maintain the
    log information properly?   6
    c) Secondary index provides logical ordering of data – explain.   2