BCSE 3rd Year 2nd Semester Examination, 2018

Database Management Systems

Full marks: 100   **Time: 3 hours**

Attempt any five questions

1) a) In the context of relational model define relation.   4
   b) Consider the following relations:
        ELECTIVE_LIST (SCODE, SNAME)
        STUDENT (ROLL, NAME)
        OPTED (ROLL, SCODE)
   ELECTIVE_LIST contains list of elective subjects, STUDENT contains data for all students. A student may choose number of elective subjects and those information are stored in OPTED.
        i) Write down the relational algebra and relational calculus expressions to find out the subject codes which have been opted by none.   2+3
        ii) Write down the relational algebra expression to find out the subject codes opted by all students.   2
        iii) Write down the calculus expression to find out the name of the students who chose the subject named 'ABC'.   3
   c) What is the use of class-subclass relation in EER diagram? Explain the constraints on specialization in EER diagram?   6

2) a) In an organization, number of projects is going on. Each project has unique project id. For each project start date, end date is stored. Each project requires different skill sets. Each skill set has unique id, type (it denotes the type of skill set like operating system/language/tool etc.) and description (i.e. name of operating system/language/tool etc.). An employee has unique employee id. Name, phone, email-id of each employee is also to be stored. An employee possesses at least one skill set. An employee may act as coordinator of zero or more projects and a project must have exactly one coordinator. Number of employees may work in a project. An employee may take part in multiple projects. An employee gets involved in a project to play the role specific to one or more skill set. The system must be able to support query regarding skill set required for a project, skill set possessed by an employee, in which projects an employee is involved, who is coordinating which project, for which skill sets an employee is involved in a project.
   Draw the ER diagram for the described system.   10

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b) In a bank, a customer can own multiple accounts and for an account there may be multiple owners. Each customer has customer id (unique), name and date of birth. For each account, account no (unique), balance is to be stored. Furthermore, system must be able to say last date of access of an account by a particular owner. Draw the ER diagram, design the tables and write down the DDL statements to create the tables. Assume the type of the attributes according to your choice.   10

3) Consider the following tables:
SUBJECT (SCODE, SNAME)
STUDENT (ROLL, NAME)
QUESTION_PAPER_DETAILS (SCODE, QUESTION_NO, ASSIGNED_MARKS)
SCORE_DETAILS (ROLL, SCODE, QUESTION_NO, SCORE)
Assume, SUBJECT contains data for all subjects, STUDENT contains data for all students, QUESTION_PAPER_DETAILS contains details of the question paper (in which question what is the marks allotted) for each subject, SCORE_DETAILS contains question number wise score of each student in each subject.
SCORE_DETAILS will have an entry only if a student answers corresponding question in a subject.
a) Suggest the foreign keys for the tables.   4
b) Write down SQL statements for the following:
     i) Find out the average score in each question for the subject named as 'ABC'
     ii) Find total score of each student in each subject
     iii) Find the subject codes for which the question paper contains maximum number of questions
     iv) Find subject codes and corresponding question numbers which are not at all answered   4x4

4) a) To store the teaching assignments of each faculty member for various batches of students, consider the following data structure (primary key is faculty-id):
Faculty-id, faculty-name and for each teaching assignment sub-code, sub-name, batch-id, batch-start-date, batch-coordinator
Further assume, the following FDs:
Faculty-id → faculty-name
sub-code→sub-name
batch-id→batch-start-date, batch-coordinator
     i) Why shall we normalize the data structure?   4
     ii) Normalize the data structure up to 3NF showing the steps. Indicate primary and foreign key wherever applicable.   8
b) Refer to the tables as in Question 3. Write down the trigger to ensure that score in SCORE_DETAILS does not exceed corresponding ASSIGNED_MARKS.   8

5) a) Compare contiguous and linked allocation of blocks in a file. 3
   b) Explain the steps for query optimization. 5
   c) What is the usefulness of B/B+ tree based indexing over binary search tree? 3
   d) A large file is ordered on key field and queried very frequently on key field. Explain your strategy. 3
   e) Two large relations R and S are to be joined. Joining attribute is primary key in R and foreign key in S. R has primary index and S has clustering index on join attribute. Explain your join strategy and specify number of disk block access. 4+2

6) a) What is a transaction? Describe the state diagram of a transaction? 6
   b) Explain, Why concurrency control is important? 6
   c) Describe timestamp based protocol for concurrency control that also can avoid cascading rollback. 8

7) a) A system follows log based recovery using redo and redo. Transactions are executed concurrently. It performs checkpoint.
     i) What is the utility of checkpoint?
     ii) What actions are taken at checkpoint?
     iii) How does the system prepare the transaction lists for redo and undo?
                                                                              3+3+6
   b) Discuss Security features of DBMS 4
   c) Define a conflict serializable schedule. 4

8) Write short notes on the following:
   a) Advantage of DBMS over file processing system
   b) Impact of foreign key on DML operation
   c) Lossless decomposition of schema
   d) Attributes of cursor in PL/SQL 4+5+5+6