Graphic Era
HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhinyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Even) Semester Examination May-June 2025

Roll no............................

Name of the Program and semester: MCA II semester
Name of the Course: Advance Database Management System
Course Code: TMC 201

Time: 3 hours   Maximum Marks: 100

Note:
(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1.   (2X10=20 Marks) Co1 & 3

a. i. Explain the different characteristics of database.

ii. Write down the responsibilities of database administrator and database designer.

b. If you are a database analyst in an organization, as a stake holder of the organization to train the customers on database environment, list the functionalities and different modules in database.

c. Develop an Entity-relationship model for a banking system using the following:
  - Customer entity with attributes customer_name, social_security_number, street and city where social_security_number is the key attribute.
  - Account entity with attributes acc_no and balance where acc_no is the key attribute.
  - Depositor relationship between customer and account entities which itself has an attribute access date.
  - A loan entity with loan_no and loan_amt as attributes which is related to the customer entity through a relationship called borrower.
  - A weak entity called payment with attributes payment_number, pamount and pdate. This entity is related to loan enity through a relationship.

For the above scenario, draw an E-R diagram by providing suitable mapping cardinalities. Convert this ER diagram into tables. Also Explain generalization using extended ER diagram in the above scenario.

Q2.   (2X10=20 Marks) Co 3

a. Explain the different steps briefly that are involved in processing a high-level query.
b. Write the algorithm to find the minimal cover for a sets of FD's.
Consider R={A,B,C,D,E,F} .FD's {A->C,AC->D,E->AD,E->H} Find the irreducible cover for this set of FD's(minimal cover)
c. Employee (empno,Fname, Minit, Lname, Bdate, Address, Sex, Salary)
Department (Dname, Dnumber, Mgrno)
Project(Pname, Pnumber, Plocation, Dnum)

Write a SQL query :
For every project located in 'Stafford', retrieve the project number, the controlling department number and the department manager's last name, address and birthdate.
Draw the initial query tree and optimize the query tree using heuristic approach.

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Q3.   (2X10=20 Marks) Co 4 &Co 5

a. During execution, a transaction passes through the several states, until it finally commits or aborts. List all possible sequence of states through which a transaction may pass. Explain the ACID properties of a transaction

b. By refereeing the following Database schema.

      Employee(Fname, Minit, Lname, SSN, Bdate, Address, Sex, Salary, Sup_SSN,Dno)

      Department(Dname, Dnumber, Mgr_SSN, Mgr_Start_date)

      Dept_Locations(Dnumber, Dlocation)

      Project(Pname, Pnumber, Plocation, Dnum)

      Works_On(Essn, Pno, Hours)

      Dependent (Essn, Dependent_Name, Sex, Bdate, Relationship)

Write the SQL Queries for the following

(i). Retrieve the name and address of all employees who work for the 'Research' department.

(ii). Make a list of all project numbers for projects that involve an employee whose last name is 'Smith', either as a worker or as a manager of the department that controls the project.

(iii). List the names of managers who have at least one dependent.

(iv). Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary.

(v). For each project, count how many employees works on it.

c. Define the following with example:

    i. Decode function

    ii. Operators used for multi-row return subquery

    iii.Views

    iv.   Cursor in PL/SQL

    v. Create a cursor to display the information of employees getting salary more than 15000.

Q4.   (2X10=20 Marks) Co2

a. Explain the need for using locks in concurrent execution of transactions. Draw the compatibility matrix for locks and explain it briefly.

b. Explain the log-based recovery mechanism to keep the database in consistent state

c. Define serializability. Give an example to show the serializability of transactions. How will you check whether a given schedule is serializable?

Q5.   (2X10=20 Marks) Co2

a. Define the architecture of distributed database. How distributed database differ from centralized database.

b. Define data replication in distributed database? Explain the different schemes used for implementing data replication.

C Explain the different types of distributed databases?.

Note For the question paper setters:
- Question paper should cover all the COs of the course.
- Please specify COs against each question.