

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2025

Paper Code: CIC-210

Subject: Database Management System

Time: 3 Hours

Maximum Marks: 60

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

- Q1 Answer the following: (4x5=20)
- a) What is a foreign key? Explain the difference between unique and primary key constraint.
 - b) What is the difference between left outer join and right outer join in SQL? Give example.
 - c) Explain the difference between 3NF and 4NF with example.
 - d) Explain log-based recovery. How is it different from shadow paging?
 - e) Differentiate between the following:
 - i) Primary index and secondary index
 - ii) Dense index and sparse index

UNIT-I

- Q2
- a) Mention any three differences between DBMS and typical file processing systems? Discuss two situations in which DBMS should not be used. (4)
 - b) Explain the 3-tier architecture of DBMS. How does DBMS provide users with considerable degree of data independence? Why is logical data independence difficult to achieve than physical data independence? (3)
 - c) Differentiate between the following: (3)
 - * Primary key and super key
 - * Weak and strong entity set
 - * Generalization and Specialization

- Q3
- a) Design a database for a bike manufacturing company to provide to maintain the buyer and employee details. Each bike has unique a vehicle id and company sell bikes of various models. Each employee can be salaried or hourly and must work for a department in the company. The employee caters to the need of buyers. For the sale of each bike, the details of order and date of sale are also maintained. Design an ER model for the same. Also perform ER to Relational mapping. (7)
 - b) What is recursive relationship? Explain with an example. (1)
 - c) Mention any three responsibilities of DBA? (2)

UNIT-II

- Q4
- a) Consider the following relational schema:
Employee(Emp_number, Emp_name, Salary)
Project(Proj_number, Proj_name, Proj_location)
Works_on(Emp_number, Proj_number)
For each of the following queries give an expression in Relational Algebra: (5)
 - i) Find the name of the projects at Delhi. ~~✗~~
 - ii) Find the name and salary of all employees working on Proj number 10 at Noida.

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- iii) Find the number of employees working on each project.
- b) Select in SQL is analogous to which operator in relational algebra? Suppose $A=\{a,b\}$ and $B=\{a,b\}$ then what will be $A \times B$ in relational algebra? (1)
- c) What is entity integrity and referential entity constraint in a relational model? (2)
- d) What is the difference between Tuple Relational Calculus (TRC) and Domain Relational Calculus (DRC)? (2)

Q5

- a) Consider the following relational schema:
 Dealer (dno, dname, daddress)
 Tractor (tid, model, price)
 Orders (dno, tid)
 Write the following queries in SQL: (4)
 - i) Find the name of dealers who have ordered all tractors of price less than Rs. 3, 50,000.
 - ii) For each model, find the name and dno of dealers who have ordered less than six tractors of that model.
 - iii) Find the dealer that has the ordered the tractor with the lowest price.
 - iv) Find the dealer that has the ordered the most number of tractors.
- b) Explain the difference between generalization and specialization? What are the different constraints on generalization/specialization? Explain with the help of example. (4)
- c) Consider the following relational schema: (2)
 Student(Rollno, Sname, Marks, Branch)
 Subject(Subject_code, Subject_name)
 Studies(Rollno, Subject_code).
 Find the name of students studying 'DBMS'. Write this query in SQL and relational algebra. <https://www.ggsipuonline.com>

UNIT-III

- Q6 a) Consider a relation $R = \{A, B, C, D, E, F, G, H, I\}$ and the following functional dependencies:
 $\{A, B\} \rightarrow C$
 $A \rightarrow D, E$
 $B \rightarrow F$ $F \rightarrow G, H$
 $D \rightarrow I, J$
 Find the key for R and normalize till BCNF. (4)
 - b) What is the difference between immediate and deferred database modification with respect to recovery? (1)
 - c) Consider the schema with attributes (P, Q, R, S, T, U) with following functional dependencies:
 $P \rightarrow R$
 $RQ \rightarrow S$
 $RQ \rightarrow T$
 $U \rightarrow S$
 - i) Is $P \rightarrow S$ implied?
 - ii) Find $\{PQ\}^+$
 - d) Explain the ACID properties of a transaction. (3)

- Q7
- a) Explain timestamp-based protocol. What is Thomas write rule? (3)
 - b) What are triggers? What is the difference between stored procedures and stored functions in PL/SQL? (3)
 - c) Write the difference between wait die and wound wait scheme for deadlock prevention? (2)
 - d) What is two-phase locking? What is the difference between strict and rigorous two-phase locking? (2)

UNIT-IV

- Q8
- a) What is a hash index? In a Hash index with 10 buckets, the hash function is defined by the sum of binary representation of characters modulus 10 and the search key is city name. If the city is "Delhi", find the bucket number where it is placed. (5)
 - b) Explain the architecture of Distributed DBMS. (3)
 - c) What is B-tree index? (2)
- Q9
- a) What is difference between single level and multi-level index? (2)
 - b) Write short note on the following: (6)
 - i) Object Oriented DBMS
 - ii) Distributed DBMS
 - c) What is difference between static hashing and dynamic hashing?(2)
