5th Semester Regular/Back Examination: 2024-25
Database Management Systems
CST, CSEAI, CSEDS, CSE, CSIT, CSEAIME, IT, CSE
Time: 3 Hour
Max Marks: 100
Q. Code: R125
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 x 10)**
   a)   Define the purpose of a database management system (DBMS).
   b)   What is the difference between schema and instance in a relational model?
   c)   Name the types of indices used in DBMS.
   d)   What are the advantages of using an ER diagram in database design?
   e)   Define functional dependency.
   f)   What is the significance of ACID properties in transaction processing?
   g)   Differentiate between primary and foreign keys.
   h)   What are the motivations for using database systems over traditional file systems?
   i)   Define 1NF with an example.
   j)   What are Armstrong's axioms for functional dependencies?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**

   a)   Explain the three-schema architecture of DBMS with a diagram.
   b)   Describe the concept of referential integrity with an example.
   c)   Give an example of a weak entity set and explain why is it weak?
   d)   Illustrate the use of SELECT and GROUP BY clauses in SQL with examples.
   e)   Describe the closure of a set of functional dependencies with an example.
   f)   Discuss the significance of BCNF and its role in database design.
   g)   Explain the process of logging and recovery in transaction management.
   h)   Differentiate between static and dynamic hashing techniques.
   i)   Describe the structure of a B+ tree and its use in indexing.
   j)   Explain the relational algebra operations UNION, INTERSECTION, and DIFFERENCE with examples.

k) Consider the following relation R(A,B,C,D,E,F) with a set of functional dependencies:
   F = {A → BC, B → CD, D → EF, BC → AG, ABG → DF}
   i.   Find the closure of each determinant.
   ii. Find the candidate key.

l) Given R(A, B, C, D, E, F) with FDs
   {A → C, B → E, AB → C, C → D, E → F}.
   Normalize R up to BCNF. Is it preserving dependency?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3   Consider the following relations: (4+4+4
   PERSON(P_id, F_name, L_name, Occupation, Salary, City)   +4)
   ORDER(O_id, P_id, Item, Quantity, Price, Order_date)

   The Primary Keys are P_id and O_id respectively.
   Express the following queries in SQL.
   i.   Find the person's name and city whose name starts with S.
   ii. Find the name of the person who has ordered in the same date.
   iii. Find the name of the person who hasn't ordered any item.
   iv. Find the highest ordered item.

Q4   Design a complete database for a university system, including ER diagrams, schema,   (16)
   and SQL queries for student registration, course management, and grade calculation.

Q5   What is conflict and view serializability. Consider the following non serial schedule: (16)

   R1(X), R2(Y), W3(Z), W2(Y), W2(X), R1(Z), W3(Y), W2(X)

   Check for conflict and view serializability.

Q6   Why do we require 2PL over lock-based protocol? How a deadlock is possible in 2PL.   (2+4
   Explain different deadlock detection and prevention techniques.   +10)