DATABASE MANAGEMENT SYSTEM

(Subject Code: CS3103)

B.Tech (Computer Science &Engineering) (Semester-IV)

Full Marks: 60 **Time: 3.00Hrs**

Question 1 is compulsory

1. **Answer all questions:** **[10x2]**

(a) Define a data model. Classify the data models into different types.

(b) Elaborate the purpose of Database Management System. State and explain the characteristics of data in a database system.

(c) Explain Union compatibility for set operators in relational algebra.

(d) Why 3NF in normal form is more desirable than BCNF? Justify with an example.

(e) Explain what is query evaluation plan with an example.

(f) What do you mean by an index? Classify different types of index structures.

(g) Elaborate the problems that arise due to concurrent execution of transactions.

(h) Explain the necessity of Two-phase Locking Protocol citing an example.

(i) Why are certain functional dependencies called as trivial functional dependencies?

(j) Define hashing. Differentiate between static and dynamic hashing.

(Answer any one question from each unit)

UNIT-I

2. (a) Explain the disadvantages of file processing system, explaining how it can be overcomed by the database system. [4]

(b) Explain the Database System architecture with a neat diagram. [6]

3. Construct an E-R diagram for an university library system. Map the corresponding entity sets and relationships to relational model. [10]

UNIT-II

4. Consider the following relational schemas:

Employee(e_name, street, city)
Works(e_name, c_name, salary)
Company(c_name, city)
Manages(e_name, manager_name)

Write the following queries using SQL, relational algebra, tuple and domain relational calculus: [10]

(a) Find the names and cities of residence of all employees who work for "Corporate" Bank.

(b) Find the names, street address and cities of residence of all employees who work for "Corporate" Bank and earn more than Rs. 30,000 per month.

(c) Find the names of all employees who lives in the same city as the company for which they work.

(d) Find the name of the company located at "New Delhi".

5. (a) Explain the Armstrong's Axioms used for deriving the functional dependencies. [4]

(b) Consider the schema Stud(Roll, Name, DOB, Sem, Branch, Course_number, Course_name) and the set of FDs: [6]

{ Roll ----->Name, DOB, Sem Name ------>Roll, Branch, Sem, Course_number Course_number ----> Course_name
Course_name ---> Name, Roll, Sem, Course_number}

Find out the highest normal form the schema is in and decompose accordingly.

UNIT-III

6. Explain the steps involved in query processing citing examples [10]

7. Consider the schema:

Emp(SSN, Fname, Lname, Salary, Deptno) where SSN is the primary key [10]

Describe two strategies in details, one using an index on Deptno and the other not using an index, for efficiently executing the following query:

```
SELECT Deptno, AVG(Salary)
FROM Emp
GROUP BY Deptno
HAVING COUNT(*) < 3
```

UNIT-IV

8. (a) Explain how the atomicity property of a transaction is implemented, [5]

(b) State and explain the property of serializability. Explain the conditions under which a schedule is said to be view-serializable. [5]

9. (a) Explain how concurrency scheme is achieved with the help of Time-stamping protocol. [5]

(b) Explain the concept of immediate update and deferred update recovery techniques with an example. [5]