Cluster Innovation Centre, University of Delhi, Delhi-110007

Examination	**: End Semester Examination – Dec 2022**
Name of the Course	**: B.Tech (Information Technology and Mathematical Innovations)**
Name of the Paper	**: Handling Information through Data Modeling and Design**
Paper Code	**: 32863103**
Semester	**: III**
Duration	**: 2 Hours**
Maximum Marks	**: 40**

Instructions:

This question paper contains seven questions, out of which any five are to be attempted. Each question carries equal marks.

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1. What are the key attributes of relational database management systems? Define the primary key, foreign key, super key, and candidate key with examples. Also, discuss their relevance.
2. What is three-schema architecture? What is data independence? Explain the level of scheme architecture and type of data independence with examples.
3. There are several terms related to DBMS. Define the following terms with the example: Data, Database, Database Management System, Database Administrator, Database User, Database Interfaces, Meta-data, Data model, Database schema, Database state, Internal schema, Conceptual schema, and External schema.
4. What is nomalisation? What is its purpose? Explain the first three normal forms with examples stating their specific improvements in the database.
5. What is the transaction? Discuss the ACID properties in DBMS with examples
6. Consider the following relational schema. An employee can work in more than one department; the pct_timefiled of the Works relation shows the percentage of time that a given employee works in a given department. Write the following queries in SQL:

   Emp(eid: integer, ename: string, age: integer, salary: real)
   Works(eid: integer, did: integer, pct_time: integer)
   Dept(did: integer, dname: string, budget: real, managerid: integer)

   a. Print the did together with the number of employees that work in that department.
   b. Find the names of employees who do not manage any department.
   c. Find the names of the employees working in the department with the largest budget.
7. Consider the universal relation $R=\{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $F = \{ \{A, B\}\rightarrow\{C\}, \{A\}\rightarrow\{D, E\}, \{B\}\rightarrow\{F\}, \{F\}\rightarrow\{G, H\}, \{D\}\rightarrow\{I, J\} \}$. What is the key for R? Decompose R into 2NF and then 3NF relations