- Each project is worked on by one or more graduate students (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
- Graduate students have one major department in which they are working on their degree.
- Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.
- Design and draw an ER diagram that captures the information about the university.
- Use only the basic ER model here; that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints.

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## 015502

### December 2023
### B.Tech. (ENG) - V SEMESTER
### Database Management Systems (CS-501)

Time : 3 Hours]      [Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

### PART–A

1. (a) What is the difference between relational calculus and relational algebra? (1.5)
   (b) What do you mean by multi-valued dependency? (1.5)
   (c) Enlist the differences between specialization and generalization. (1.5)
   (d) Write down the differences between truncate, delete and drop commands. (1.5)
   (e) What are DCL commands in SQL? (1.5)
   (f) State the difference between authorization and authentication. (1.5)
   (g) Explain 'I' in 'ACID' properties. (1.5)

(h) Differentiate between Grant and Revoke. (1.5)

(i) What are the responsibilities of DBA? (1.5)

(j) What is a Sparse Index? (1.5)

## PART–B

2. (a) Write short notes on : Object oriented and object relational databases, Logical databases, Web databases, and Distributed databases? (10)

(b) Consider a relation R with attribute set {A, B, C, D} and functional dependency set $F = \{A \to B, B \to C, C \to D\}$. This relation is decomposed into three sub relations {AB, BC, CD}. Check if the decomposition is dependency preserving or not. (5)

3. (a) Explain Lost-Update Problem. How can Lost-Update problem be solved? (5)

(b) Consider the following relation for published books :
BOOK (Book_title, Author_name, Book_type, List_price, Author_affil; Publisher) Author_affil refers to the affiliation of author. Suppose the following dependencies exist :
Book title Publisher,
Book_typeBook_type → List_price
Author_name → Author_affil

1. What normal form is the relation in? Explain your answer.

2. Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition. (10)

4. Explain DAC, MAC and RBAC models in detail. (15)

5. (a) What is the phantom problem? Can it occur in a database where the set of database objects is fixed and only the values of objects can be changed? (5)

(b) Define serializability. Differentiate between view and conflict serializable schedule with examples. (10)

6. (a) Why is indexing required for a Database? (5)

(b) Explain different type of indexing techniques. Is it true that all the levels of multi-level index are primary index? Discuss. (10)

7. (a) Consider the following information about a university database : (15)

- Professors have an SSN, a name, an age, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
- Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
- Each project is managed by one professor (known as the project's principal investigator).
- Each project is worked on by one or more professors (known as the project's co-investigators).
- Professors can manage and/or work on multiple projects.