

Question Paper consists of FIVE units, each carrying 14 marks
 Each unit has TWO questions; either of them should be answered
 All parts of a question must be answered at one place.

UNIT-I

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| 1. | a) | Describe the client server architecture for the database with necessary diagram. | 7M |
| | b) | What do you understand by the term data model? Explain the differences between various data models. | 7M |

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| 2. | a) | What is logical data independence and why is it important? | 7M |
| | b) | What are the responsibilities of the DBA and the database designers? | 7M |

UNIT-II

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| 3. | a) | <p>Consider the following information about a university database:</p> <p>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. 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.</p> <p>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.</p> | 10M |
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| | b) | What is a view? How views are implemented? | 4M |
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| 4. | a) | How to maintain class hierarchies in ER-Diagrams? And How various constraints can be modeled in ER-Diagram? Explain with employee database. | 7M |
| | b) | Name the main steps in database design? What is the goal of each step? Why is designing a database for a large enterprise especially hard? | 7M |

UNIT-III

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| 5. | a) | Explain the importance of Trigger in SQL. | 7M |
| | b) | What is an integrity constraint? Briefly describe different integrity constraints. | 7M |

(OR)

6. a) Consider the following schema:

Suppliers(sid: integer, sname: string, address: string)

Parts(pid: integer, pname: string, color: string)

Catalog(sid: integer, pid: integer, cost: real)

The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in SQL, relational algebra:

14M

- i) Find the names of suppliers who supply some red part.
- ii) Find the sids of suppliers who supply some red part or are at 221 Packer Street.
- iii) Find the sids of suppliers who supply every red or green part.
- iv) Find pairs of sids such that the supplier with the first sid charges more for some part than the supplier with the second sid.
- v) Find the pids of parts supplied by at least two different suppliers.
- vi) Find the pids of the most expensive parts supplied by suppliers named Yosemite Sham.

UNIT-IV

7. a) 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, then 3NF relations. 7M
- b) What is decomposition? Discuss in detail about problems related to decomposition. 7M

(OR)

8. a) How to find closure of an attribute based on a given set of FDs? Compute the closure of the following set F of functional dependencies for relation schema $r(A, B, C, D, E)$. List the candidate keys for R. 7M
- $A \rightarrow BC$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$
- b) State 5NF. Discuss join dependencies with an example. 7M

UNIT-V

9. a) Consider the following two transactions: 7M
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|---------------------------|---------------------------|
| T1 : read(A); | T2: read(B); |
| read(B); | read(A); |
| if A = 0 then B := B + 1; | if B = 0 then A := A + 1; |
| write(B). | write(A). |

Let the consistency requirement be $A = 0 \vee B = 0$, with $A = B = 0$ the initial values.

- i) Show a concurrent execution of T1 and T2 that produces a non-serializable schedule.
- ii) Is there a concurrent execution of T1 and T2 that produces a serializable schedule?

- b) What is 2-phase locking protocol? How does it guarantee serializability? 7M

(OR)

10. a) What is a cascade less schedule? Why is cascade lessness of schedules desirable? Are there any circumstances under which it would be desirable to allow non-cascade less schedules? Explain your answer. 7M
- b) Why concurrency control is needed? Explain the problems that would arise when concurrency control is not provided by the database system. 7M