

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

# GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Sem-I Examination January 2010

**Subject code: 610005**

**Subject Name: Database Management Systems-I**

**Date: 28 / 01/ 2010**

**Time: 12.00 -2.30pm**

**Total Marks: 70**

## Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Compare and contrast two-tier and three-tier database architecture. Also explain the types of database users and the role of a database administrator. **07**
- (b) What are the advantages and disadvantages of providing secondary indexes and primary indexes? How does multilevel indexing improve the efficiency of searching an index file? **07**
- Q.2** (a) A university registrar's office maintains data about the following entities : **07**  
(a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s) timings, and classroom; (c) students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.
- (b) Define the concept of aggregation in E-R model. Give two examples where aggregation is useful. **07**
- OR**
- (b) State Armstrong's axioms to find logically implied functional dependencies. Use these axioms to prove the soundness of the decomposition rule. **07**
- Q.3** (a) Distinguish between data manipulation languages and data definition languages giving suitable examples. **07**
- (b) What is data dictionary ? How is data represented in a data dictionary. **07**
- OR**
- Q.3** (a) What do you understand by repetition of information and inability to represent information ? Explain why each of these properties may indicate a bad relational database design. **07**
- (b) Distinguish between a weak entity set and a strong entity set. Explain how a weak entity set can be converted into a strong entity set and how it can participate in relationships, giving suitable examples. **07**
- Q.4** (a) Explain the difference between physical and logical data independence. **07**
- (b) Suppose that we decompose the schema  $R = (A, B, C, D, E)$  into  $(A, B, C)$  and  $(A, D, E)$ . Show that this decomposition is a lossless decomposition if the following set  $F$  of functional dependencies holds :  $A \rightarrow BC, CD \rightarrow E, B \rightarrow D$  and  $E \rightarrow A$ . Also, give a lossless, dependency-preserving decomposition into 3NF of schema  $R$ . **07**

**OR**

- Q.4** (a) Compare and contrast the different types of constraints and generalizations. **07**  
(b) Compare the terms primary key, candidate key and super key, giving suitable examples. Also, explain the mapping cardinalities that can exist between two entity sets in a binary relationship. **07**

- Q.5** (a) What is UML ? Explain the parts of UML ? Show the UML class diagram notations for its equivalent E-R diagram constructs. **07**  
(b) Distinguish between a file-processing system and a database management system. **07**

**OR**

- Q.5** (a) Define the constraint multivalued dependency. Explain fourth normal form (4NF). Why is 4NF more desirable than BCNF ? **07**  
(b) Distinguish between entity sets and relationship sets. Also, compare binary relationship sets and n-ary relationship sets. **07**

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