

GUJARAT TECHNOLOGICAL UNIVERSITY**MCA. Sem- IST Regular / Remedial Examination January/ February 2011****Subject code: 610005 Subject Name: Database Management Systems-I****Date: 02 /02 /2011****Time: 10.30 am – 01.00 pm****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) Fill in the blanks:**07**

1. DBMS stands for _____.
2. System database that contains data about relations (like schema, constraints etc.) is called _____.
3. A table can have only one _____ key.
4. In relational model, association between tables is defined using _____ keys.
5. In three-tier architecture, business logic is embedded in _____ server. (application/database)
6. A person having central control of both data and database programs is called _____.
7. _____ pre-compiler converts embedded DML statements to normal procedure calls in the host language.
8. Double lines are used in E-R diagram to indicate _____ of an entity set in a relationship set.
9. Set of attributes that allows distinguishing among the weak entities owned by a specific strong entity is called _____.
10. Relation schema R is in _____ normal form if domains of all attributes of R are atomic. (first, third)
11. In E-R diagram, _____ expresses the specific number of entity occurrences associated with one occurrence of the related entity.
12. In E-R model, _____ is a top-down design process. (specialization/generalization)
13. FD of the form $\alpha \rightarrow \beta$ is trivial if _____.
14. _____ decomposition is based on multi-valued dependencies. (BCNF/4NF)

(b) Write true/false. Justify your answer.**07**

1. Relation in 3NF is always in BCNF.
2. BCNF decomposition may not be dependency preserving.
3. For $R(A,B,C)$ and $F=\{A \rightarrow B, AB \rightarrow C\}$, $A \rightarrow C$ is in F^+ .
4. Primary key constraint in relational data defines domain constraints.
5. Foreign key cannot be NULL.
6. Every FD is an MVD but not every MVD is an FD.
7. To check whether FD $X \rightarrow Y$ is implied by given set of FDs F, one may use closure of attribute Y using F.

Q.2 (a) Define/explain following terms:**07**

1. Entity integrity constraint
2. Database system
3. Functional dependency
4. Entity
5. Closure of FDs
6. Assertion
7. Aggregation in E-R model

- (b) 1. Write Armstrong's axioms for inference of FDs. **03**
 2. List advantages of database system over file-processing system. Explain any one in detail. **02**
 3. Differentiate between primary and candidate key. **02**
- OR**
- (b) 1. Write an algorithm for computing closure of attributes. **03**
 2. Using closure of attributes, answer the following for $R(A,B,C,D)$ and $F=\{AB \rightarrow C, D \rightarrow A\}$
 i. Is (BD) a candidate key? **02**
 ii. Does $BC \rightarrow D$ hold on R ? **02**
- Q.3 (a)** Define E-R diagram. List and explain different symbols used in Chen's E-R notation. **05**
- (b)** Design E-R diagram for airport. Airport database keeps track of airplanes, their owners, airport employees and pilots. **10**
- Each airplane has a registration number, is of particular plane type and is stored in a particular hanger.
 - Each plane type has a model number, capacity and weight.
 - Each hanger has a number, capacity to hold number of airplanes and location.
 - The database also keeps track of who owns which plane. Persons have name, address and phones. A person buys a plane on a particular date and with cost.
 - Pilots and employees are persons. Pilots have a license number with validity and salary. Employees have a number, rank and salary.
 - Each pilot is authorized to fly certain types of planes.
 - Employees are involved in servicing of planes.
 - Each plane undergoes service many times. Service information contains date of work, nature, hours spent, cost, etc.
- OR**
- Q.3 (a)** Write full form of UML. List and explain different symbols used in UML class diagram notation. **05**
- (b)** Design UML class diagram for an IT training company. For each training session, a company has 12 instructors to handle up to 100 trainees. The company offers 5 advanced technology courses, each of which is taught by a team of 2 or more instructors. Each instructor is assigned to a maximum of two teaching teams. Each trainee undertakes one advanced technology course per training session. **10**
- Q.4 (a)** Draw E-R diagram and map it to relational model. **07**
- In MCA syllabus, numbers of subjects are taught. Each subject may have one or more other subjects as prerequisites, or may have no prerequisites.
- (b)** 1. Explain about physical data independence. **03**
 2. Decompose following using 3NF decomposition. Consider a relation with schema:
 $Movie\{title, year, studioNm, president, presidentAddress\}$.
 $F=\{title, year \rightarrow studioNm, studioNm \rightarrow president,$
 $President \rightarrow presidentAddress\}$ **04**
- OR**
- Q.4 (a)** Draw E-R diagram and map it to relational model. **07**
- Programmers are having skills in one or more technology like vb.net, C#.net, C, C++, Java etc. One or more technology may be used in a project. Programmers are assigned to a project in such a way that they are having skills required to develop a project.

- (b) 1. Describe functions of DBA. 03
 2. Decompose following using BCNF decomposition. Consider a relation with 04
 schema:
 Movie {title, year, studioNm, president, presidentAddress}.
 $F = \{ \text{title, year} \rightarrow \text{studioNm}, \text{studioNm} \rightarrow \text{president}, \text{President} \rightarrow \text{presidentAddress} \}$

- Q.5 (a) Define MVD. Discuss about 4NF. 07
 (b) Consider $R(A, B, C, D)$ and $F = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$. Check whether 07
 decomposition of R into $R_1(A, B, C)$ and $R_2(A, D, E)$ lossless and dependency
 preserving?

OR

- Q.5 (a) Describe different types of information stored in data dictionary. 07
 (b) Write algorithm for computing canonical cover. Compute canonical cover for 07
 $R(A, B, C, D, E)$ and $F = \{AB \rightarrow C, C \rightarrow A, BC \rightarrow D, ACD \rightarrow B, BE \rightarrow C, CE \rightarrow AB, C \rightarrow BD, D \rightarrow E\}$.
