

## B2.2-R3: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

### NOTE:

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.
3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

**TOTAL TIME: 3 HOURS**

**TOTAL MARKS: 100**  
**(PART ONE – 40; PART TWO – 60)**

### **PART ONE** **(Answer all the questions)**

1. **Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the “tear-off” answer sheet attached to the question paper, following instructions therein. (1 x 10)**
  - 1.1 In a relational database a referential integrity constraint is specified with the help of
    - A) Primary key
    - B) Foreign key
    - C) Secondary key
    - D) Consistency checking
  - 1.2 A view of a database that appears to an application program is known as
    - A) Report
    - B) Structure
    - C) Subschema
    - D) Scheme
  - 1.3 Which of the following is not a logical database structure?
    - A) Network
    - B) Relational
    - C) Chain
    - D) Tree
  - 1.4 The tables generated on compilation of data definition language (DDL) are stored in
    - A) Data abstraction
    - B) Data dictionary
    - C) Data file
    - D) Meta file
  - 1.5 Suppose a relational table R (A, B, C, D, E) have three distinct rows, then cardinality and degree of this relation is
    - A) 5, 3
    - B) 3, 5
    - C) 3, 3
    - D) 5, 5

- 1.6 Every Boyce-Code Normal Form (BCNF) is in  
A) Third Normal Form (3NF)  
B) First Normal Form (1NF)  
C) Second Normal Form (2NF)  
D) None of the above
- 1.7 Two schedules are conflict equivalent if  
A) Involve the same actions of the same transactions  
B) Every pair of conflicting actions is ordered the same way  
C) Both A) and B)  
D) None of the above
- 1.8 The decomposition of R into X and Y is lossless-join w.r.t. F if and only if the closure of F contains  
A)  $X \cap Y \rightarrow X$   
B)  $X \cap Y \rightarrow Y$   
C) Both A) and B)  
D) None of the above
- 1.9 Consider the functional dependencies: -  $A \rightarrow B$ ,  $BC \rightarrow D$ , then closure of AC i.e.  $(AC)^+$  is  
A) A  
B) AB  
C) AC  
D) ABCD
- 1.10 A multi-level indexing may lead to  
A) Binary tree  
B) Deadlock  
C) Transaction failure  
D) B-Tree

2. Each statement below is either TRUE or FALSE. Choose the most appropriate one and ENTER in the “tear-off” sheet attached to the question paper, following instructions therein. (1 x 10)

- 2.1 Relational data model is the most widely used model today.
- 2.2 A weak entity can be identified uniquely only by considering super key of owner entity.
- 2.3 Views can be used to present necessary information (or a summary), while hiding details in underlying relation(s).
- 2.4 Relations do not contain any duplicate topics.
- 2.5 A relation is said to be in the third normal form if it is already in the second normal form and every determinant is a candidate key.
- 2.6 The difference of two relations A and B is a new relation which consists of all the topics of A which are not in B.
- 2.7 Transaction that holds a shared lock can not be upgraded to hold an exclusive lock.
- 2.8 The decomposition of R into UV and R - V is lossless-join if  $U \rightarrow V$  holds over R.
- 2.9 If R is decomposed into X, Y and Z, and we enforce the FDs that hold on X, on Y and on Z, then only some FDs that were given to hold on R must also hold.
- 2.10 Concurrency control protects against simultaneous access to a single record by multiple users.

3. Match words and phrases in column X with the closest related meaning/ word(s)/phrase(s) in column Y. Enter your selection in the “tear-off” answer sheet attached to the question paper, following instructions therein. (1 x 10)

X		Y	
3.1	Natural join	A.	Granularity
3.2	Integrity provisions	B.	A description of a particular collection of data, using a given data
3.3	Microsoft Access	C.	Equivalent to Cartesian product
3.4	Entity-Relationship Model	D.	DBA
3.5	Normalization	E.	Deadlock detection
3.6	Assertions	F.	Hierarchical model
3.7	Audit Trail	G.	Used to design the database structure for a particular application
3.8	Schemas	H.	Ensures that data remains consistent with itself
3.9	Wait-for graph	I.	Rationalizes the structure of the tables in the entity-relationship model
3.10	Locking level	J.	Changes should be stored
		K.	Duplicate columns are removed
		L.	Relational model
		M.	Database schema constraints
		N.	Duplicate rows are removed
		O.	Relation

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the “tear-off” answer sheet attached to the question paper, following instructions therein. (1 x 10)

<b>A.</b>	COMMIT	<b>B.</b>	ROLLBACK	<b>C.</b>	Attribute
<b>D.</b>	Data Dictionary	<b>E.</b>	Triggers	<b>F.</b>	Nested query
<b>G.</b>	DBMS	<b>H.</b>	Normalization	<b>I.</b>	Tuple
<b>J.</b>	NULL	<b>K.</b>	Schema	<b>L.</b>	E-R diagram
<b>M.</b>	CANCEL				

- 4.1 A(n) \_\_\_\_\_ is a named column of a relation.
- 4.2 \_\_\_\_\_ is a software system that enables users to define, create and maintain the database and provides controlled access to this database.
- 4.3 \_\_\_\_\_ is when a SELECT statement embedded within another SELECT statement.
- 4.4 A(n) \_\_\_\_\_ is a row of a relation.
- 4.5 The \_\_\_\_\_ command in SQL marks the finalization of a database transaction.
- 4.6 \_\_\_\_\_ is the process of organizing data to minimize redundancy and remove ambiguity.
- 4.7 The \_\_\_\_\_ is a SQL command which cancels/undoes the proposed changes in a pending database transaction and marks the end of the transaction.
- 4.8 \_\_\_\_\_ are special type of stored procedures executed automatically when certain events take place.
- 4.9 The \_\_\_\_\_ SQL keyword is used to represent a missing value.
- 4.10 \_\_\_\_\_ is a catalog of all the attributes for a data set, along with all the constraints placed on the attribute values during the data definition phase.

**PART TWO**  
(Answer any **FOUR** questions)

- 5.**
- a) What is the difference between logical data independence and physical data independence?
  - b) Explain the procedure to perform ER-to Relational mapping with the help of a suitable example.
  - c) Compare the following:  
Weak-entity set Vs Strong –entity set  
Super key Vs Foreign key
- (5+5+5)**

- 6.**
- a) Consider the following “Sailors” and “Reserves” relations  
**R (sid, bid, day)**  
**S (sid, sname, rating, age)**
    - I) Formulate the following queries using relational algebra:
      - i) Find names of sailors who’ve reserved boat #XXX.
      - ii) Find sailors who’ve reserved a red or a green boat.
      - iii) Find the names of sailors who’ve reserved all boats.
    - II) Formulate the following queries using SQL:
      - i) Find sid’s of sailors who’ve reserved a red or a green boat.
      - ii) Find names of sailors who’ve reserved boat #XXX.
      - iii) Find sailors whose rating is greater than that of some sailor called XYZ.
  - b) Explain, how referential integrity is enforced in SQL.
- (12+3)**

- 7.**
- a) What is the purpose of ‘VIEW’ operation in SQL? Explain how is it created. List its advantages.
  - b) Suppose we have a relation *ABCD* with some FD’s *F* as follows:  
 $F = AB \rightarrow C, C \rightarrow D, D \rightarrow A.$   
Compute closures  $A^+, C^+, (AB)^+, (AC)^+$  and all FD’s(functional dependencies) that follow from *F* .
  - c) Explain BCNF with the help of an example.
- (5+5+5)**

- 8.**
- a) State the conditions for the two schedules to be equivalent. Define a serializable schedule.
  - b) Explain, how cascaded rollback can be avoided?
  - c) Define necessary conditions for the occurrence of deadlock. How it can be avoided?
- (6+3+6)**

- 9.**
- a) Explain the basic objectives of database security. Who is responsible for overall security? Discuss two main approaches to DBMS security.
  - b) Explain timestamp based concurrency control algorithm.
  - c) What causes a transaction to fail? List the tasks of recovery manager. Discuss recovery using log records.
- (5+5+5)**