A7-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, two records are linked by
A) cell addresses.
B) Inter-record gaps.
C) cross correlation matrices.
D) key fields.

1.2 In a database, another name for Locate and Display is
A) sort
B) calculate and format
C) query
D) search and destroy

1.3 Form that is used to collect data in a structured manner for entry to a database is called a
A) database design form
B) systems flowchart
C) data capture form
D) none of the above

1.4 If there are no repeating attributes or groups of attributes, data are said to be:
A) Redundant
B) First Normal Form
C) Second Normal Form
D) Third Normal Form

1.5 Which one of the following is NOT likely to be found in a database dictionary?
A) Names of fields
B) Frequency of back ups
C) Programs to access the data
D) Security of the data

1.6 Which one of these functions would be carried out by the database management system?
A) Design of tables
B) Normalization the data
C) Data backup
D) Determination of entity relationships

1.7 Which of these queries processes the data in some way?
A) Sort query
B) Select Query
C) Cross tab query
D) Update query

1.8 A relation schema R is in 3rd normal form if
A) each nonprime attribute in R is fully dependent on every key
B) all attributes in R have atomic domains
C) R satisfies 2nd normal form and no nonprime attribute of R is transitively dependent on the primary key
D) R contains only 3 keys

1.9 In SQL, if we want to designate that column A, B and C are all candidate keys we can add the following constraint to each column definition
A) unique
B) primary key
C) foreign key
D) not null

1.10 When we map an n-ary relationship (where n > 2) from the ER Model to the relational model we
A) create a table with n foreign keys
B) create a table with a primary key but no foreign keys
C) create n tables
D) none of the above

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 The relational database model is a logical representation of data that allows relationships among data to be considered without concern for the physical structure of the data.
2.2 Providing duplicate values for the primary-key field of multiple rows causes the DBMS to terminate.
2.3 There is a one-to-one relationship between a primary key and its corresponding foreign key.
2.4 The results of a query can be arranged in ascending or descending order using the optional ORDER BY clause.
2.5 Each time the user performs a sorting operation, the program is not performing another query on the database.
2.6 When creating a database you must know the physical location of the information you want to use.
2.7 An instance is an occurrence of an entity class that can be uniquely described.
2.8 One disadvantage of databases is that they are static; that is, once the database structure is established, it cannot be changed.
2.9 A field that contains numbers should be specified as a numeric field, regardless of the type of data it contains.
2.10 Hierarchical databases are better than most at minimizing data redundancy.

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	Refers to the validity, accuracy, and consistency of the data in a database.	**A.**	Field
3.2	A person, place, thing, or event about which we want to record information; an object we're interested in.	**B.**	Data Definition Language (DDL)
3.3	The smallest structure in a relational database used to store the individual pieces of data about the object; stores a single fact about an object that we're interested in; represents an attribute.	**C.**	Hierarchical data
3.4	Uniquely identifies each record in a table and the field lives in the table for which it operates.	**D.**	SQL
3.5	Establishes a connection or correspondence or link between a pair of tables in a database, or between a pair of entities in an entity-relationship diagram (ERD).	**E.**	Primary Key
3.6	The language used to define objects in a database: CREATE TABLE, CREATE INDEX, and so on.	**F.**	Ascending Sort
3.7	Any sort which arranges records from highest value to lowest value	**G.**	Insert
3.8	Data that is organized into categories and subcategories	**H.**	Relationship
3.9	Used to query a database and have a result set returned.	**I.**	Data Integrity
3.10	A SQL command used to add a new record to a table within a database.	**J.**	Update
		K.	Entity
		L.	Data
		M.	foreign Key
		N.	Descending Sort

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)

A.	NULL	**B.**	Candidate	**C.**	Functional
D.	Queries	**E.**	Data	**F.**	Tuple
G.	Normalization	**H.**	Keys	**I.**	Append
J.	MySQL	**K.**	Data Flow Diagram (DFD)	**L.**	Boyce-Codd Normal Form (BCNF)
M.	Locks	**N.**	An entity-relationship (ER)		

4.1 _____ the process of organizing data to minimize redundancy and remove ambiguity.

4.2 The _____ SQL keyword is used to represent a missing value.

4.3 _____ are the main way to make a request for information from a database.

4.4 _____ are used by Database management systems to facilitate concurrency control.

4.5 _____ is an open source relational database management system.

4.6 A(n) _____ key is a combination of attributes that can be uniquely used to identify a database record without any extraneous data.

4.7 A relation is in _____ if every determinant is a candidate key.

4.8 A(n) _____ is a specialized graphic that illustrates the interrelationships between entities in a database.

4.9 A(n) _____ dependency occurs when one attribute in a relation uniquely determines another attribute.

4.10 _____ refers to a collection of one or more attributes.

PART TWO

(Answer any **FOUR** questions)

5.

a) What are the differences between the terms: CANDIDATE KEY, PRIMARY KEY, SUPER KEY and COMPOSITE KEY?

b) Let R(A,B,C,D) be a relation schema with
- the FDs A→BCD and B→CD and
- the MVD A →→B.

Answer the following:

i) Find all possible keys of R.

ii) Is the relation in 4NF?

c) Explain, how the object-oriented database model varies from the relational database model.

(4+(4+3)+4)

6. Consider the following tables:

EMPLOYEE

EID	ENAME
1	Tom
2	Bill
3	Mary
4	Alice

PROJECT

PID	PNAME
100	A
200	B
300	C
400	D

ASSIGNMENT

EID	PID	HOURS
1	200	10
1	300	20
2	100	25
3	400	35
4	100	20
4	200	15

Determine the result of the following SQL queries:

i)
```
SELECT PNAME, COUNT(*) AS CNT
FROM PROJECT, ASSIGNMENT
WHERE PROJECT.PID = ASSIGNMENT.PID
GROUP BY PID;
```

ii)
```
SELECT ENAME, SUM(HOURS) AS TOTAL_HOURS
FROM EMPLOYEE, ASSIGNMENT
WHERE EMPLOYEE.EID = ASSIGNMENT.EID
GROUP BY EID;
```

iii)
```
SELECT ENAME, PNAME
FROM EMPLOYEE, PROJECT, ASSIGNMENT
WHERE PROJECT.PID = ASSIGNMENT.PID
AND EMPLOYEE.EID = ASSIGNMENT.EID;
```

(5+5+5)

7. A company has several departments. Each department has a supervisor and at least one employee. Employees must be assigned to at least one, but possibly more departments. At least one employee is assigned to a project, but an employee may be on vacation and not assigned to any projects. The important data fields are the names of the departments, projects, supervisors and employees, as well as the supervisor and employee number and a unique project number.

a) Identify the Entities in the above case.

b) What are relationships between the identified entities?

c) Draw an Entity Relationship diagram to demonstrate the connectivity between the various entities.

(4+4+7)

8.

a) Which is a higher quality database design: 1st normal form or 3rd normal form? Explain.

b) Assuming you are using DBMS that provides locking facilities. How programs are to be written to:

   i) avoid deadlock

   ii) guarantee correct results

c) Explain third normal form with example.

(4+6+5)

9.

a) List Codd's rules to qualify a database as relational.

b) Write short note on ill effects of concurrency.

c) Explain briefly distributed databases.

(5+5+5)