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 Consider the join of a relation A with a relation B. If A has k tuples and B has r tuples then the maximum and minimum sizes of the join respectively are
A) k + r and 0
B) r.k and 0
C) r + k and |k-r|
D) r.k and r + k

1.2 Which of the following is not transaction characteristic in SQL?
A) access mode
B) diagnostics size
C) isolation level
D) commit

1.3 Which of the following cannot enhance database system throughput?
A) Database system throughput can be enhanced by locking the smallest sized objects possible
B) Database system throughput can be enhanced by reducing the time that transaction that hold locks
C) Database system throughput can be enhanced by reducing the hot spots (frequently accessed and modified database objects)
D) Increasing the main memory capacity can enhance database system throughput.

1.4   In a relational database a referential integrity constraint is specified with the help of
A)   Primary key
B)   Consistency key
C)   Foreign key
D)   None of the above

1.5   The set of attributes $X \subseteq$ Schema(R) is a super key for relation schema R only if
A)   For all relations r over R the number of tuples in projection over X of r is the same as the number of tuples in r
B)   All attributes of X are having non null values
C)   All attributes of X are having unique values
D)   None of the above

1.6   Consider the relation scheme R(A,B,C,D) where A is candidate key. With no information about FDs involved, then R is in which normal form?
A)   First Normal form
B)   Second normal form
C)   BCNF
D)   Third Normal form

1.7   Object based data models are used in describing the abstraction of the following level(5).
A)   Only physical
B)   Conceptual and view
C)   Physical and conceptual
D)   None of the above

1.8   Which of the following are minimal keys for a relation R with F = {AB→C, C→A}:
A)   AB, AC
B)   AB, BC
C)   BC, AC
D)   ABC, AB

1.9   B+ Trees are preferred to binary trees since
A)   Disk capacities are higher than memory capacities
B)   Memory access is faster than disk access
C)   Disk are more reliable than memory
D)   Disk data transfer rates are much less than memory transfer rates.

1.10   Under which condition, the value R   S / S equal to R (here   stands natural join and / denotes division).
A)   When R and S are having at least one attribute common
B)   The degree of S is less than the degree of R.
C)   The degree of R is less than the degree of S.
D)   When R and S are having no attribute in common.

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   SERIALIZABLE is one the transaction isolation level in Structured Query Language.
2.2   Two-phase locking protocol is an optimistic based protocol.
2.3   The process of check pointing reduces the amount of work done by DBMS during the restarting process.
2.4   Usage of Table alias is essential in performing a join operation of table R with itself.
2.5   Tuple relational calculus is declarative and procedural oriented language.
2.6   Selection, projection, union, difference, intersection and Cartesian product operations formulate   a complete set of relational algebra.
2.7   Any arithmetic comparison involving null is always an null.
2.8   Domain relational calculus restricted to safe domain expressions is equivalent in expressive power to the basic relational algebra.
2.9   Logging and recovery manager is responsible for the durability of transactions.
2.10   Minimal cover for a given set of Functional dependencies F is unique.

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	Physical Model	**A.**	Used to discard the false groups from a table
3.2	Secondary index	**B.**	B-tree
3.3	Non-procedural query	**C.**	Relational algebra
3.4	Closure of a set of attributes	**D.**	>ANY
3.5	The normal form of R(ABC) with $F = \{A \rightarrow BC, B \rightarrow C\}$	**E.**	Domain calculus
3.6	IN of SQL	**F.**	Second normal form
3.7	Having clause of SQL	**G.**	Relational algebra operation
3.8	Where clause of SQL	**H.**	External Model
3.9	The normal form of R(ABC) with $F = \{A \rightarrow BC, B \rightarrow A\}$	**I.**	Third Normal form
3.10	Natural join	**J.**	Functional dependency
		K.	BCNF
		L.	=ANY
		M.	Used to eliminate the false tuples from a table

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.	B+	B.	unique	C.	Views
D.	Thomas Write Rule	E.	unlimited	F.	3
G.	BCNF	H.	View	I.	6
J.	Generalization	K.	Commit	L.	Third normal form

4.1 Ignoring outdated writes is termed as _____.

4.2 The maximum number of rows returned by the following SQL query is _____.

   select empno, empname from emp where salary = (select min(salary) from emp);

4.3 A technique where in attributes that are common to several types of an entity are grouped into their own entity, called super types is termed as _____.

4.4 Let R(ABC) be a relation schema with MVD A $\rightarrow\rightarrow$ B. If we know that the tuples (a,b1,c1), (a,b2,c2) and (a,b3,c3) are in the current instance of R, _____ the number of other tuples must also exist in the instance R.

4.5 _____ index can occur only one per table in SQL.

4.6 Every binary relation is in ____ normal form.

4.7 Range queries are faster ____ tree data structure.

4.8 A table whose rows is not explicitly stored in the database but is determined when needed is termed as a _____.

4.9 _____ provides support for logical data independence in the relational model.

4.10 _____ primitive set of operations is needed to express division operation of relational algebra.

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

5. Suppose you have a table for a dance studio. The attributes are dancer's identification number, dancer's name, dancer's address, dancer's telephone number, class identification number, day that the class meets, time that the class meets, instructor name, and instructor identification number. Assume that each dancer takes one class, each class meets only once a week and has one instructor, and each instructor can teach more than one class.

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   Dancer (Dancer_ID, Dancer_Name, Dancer_Address, Dancer_Phone,
   Class_ID, Class_Day, Class_Time, Instructor_Name, Instructor_ID)
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   a) Draw an entity-relationship diagram (ERD) for this database.
   b) Convert into a collection of 3NF relations.

   (5+10)

6.
   a) State any five advantages of DBMS?
   b) Mention any three advantages of views?
   c) Explain the difference between external, internal and conceptual schemas. How are these different layers are related to the concepts of logical and physical and physical data independence.

   (5+3+7)

7.
   a) Why is it not straightforward to integrate SQL queries with a host programming language?
   b) How cursors addresses the impedance mismatch between host languages and SQL.
   c) In what way dynamic SQL is different from embedded SQL?
   d) What are ACID properties? Explain their significance in DBMS.

   (3+4+3+5)

8.
   a) Suppose we have a functional dependency of the form X→Y on a relation R. Specify conditions on X and Y such that X is a candidate key for R. How would you capture an arbitrary functional dependency X→Y in ER design.
   b) Consider a relation schema R (A, B, C, D, E, F, G) and a set of functional dependencies F = {A→ABCDEFG, CE→A, BD→E, C→B}. Give a loss-less join, dependency preserving 3NF decomposition of R.

   (7+8)

9.
   a) Explain, how buffering and caching techniques are used in recovery sub system.
   b) What implications would a no steal/force buffer management policy have on check pointing and recovery?

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c) What is deadlock? How does it occur?

(6+5+4)