

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 A schema describes
 - A) Record Relationship
 - B) Data Elements
 - C) Record and files
 - D) All of the above
 - 1.2 The physical location of a record is determined by a mathematical formula that transforms a file key in to a record location in
 - A) A B-Tree File
 - B) An indexed file
 - C) A hashed file
 - D) None of the above
 - 1.3 An abstraction concept for building composite objects from their component object is called
 - A) Specialization
 - B) Normalization
 - C) Generalization
 - D) Aggregation
 - 1.4 The JOIN operator can be specified as
 - A) Rx S
 - B) $\sigma_{(\text{condition})} (RxS)$
 - C) Both A) and B)
 - D) None of the above

1.5 The expression $(R \cup S) - ((R - S) \cup (S - R))$ is equivalent to

- A) $R \cap S$
- B) $R \cup S$
- C) $\sigma_{\text{(condition)}}(R \times S)$
- D) $\pi(R \times S)$

1.6 A statement that is executed automatically by the system as a side effect of a modification to the database is known as

- A) Assertion
- B) Triggers
- C) Referential constraints
- D) None of the above

1.7 An audit trail

- A) Can be used to restore lost information
- B) Is used to make backup copies
- C) Is the recovered history of operations performed on a file
- D) All of the above

1.8 A model used to describe data at the logical and view level

- A) Object based logical models
- B) Record based logical models
- C) Physical models
- D) None of the above

1.9 A normal form in which every determinant is a key

- A) 2NF
- B) 3NF
- C) BCNF
- D) 4NF

1.10 A property which ensures that each functional dependency is represented in some individual relation resulting after decomposition

- A) Loss less join
- B) Dependency preservation
- C) Both A) and B)
- 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 referential integrity rule states that every foreign key value must match a key value in an associated table.
- 2.2 Relational calculus employs procedural way for stating queries.
- 2.3 The division operator can be expressed as a sequence of π , X and – operations.
- 2.4 In a hierarchical database, modeling of many to many relations is achieved by record replication.
- 2.5 A foreign key may not have null or partial null values.
- 2.6 ER diagram functions performed by a system.
- 2.7 During the process of recovery, each pair of physical blocks is examined.
- 2.8 Stable storage is implemented by replicating the needed information in several non-volatile disks with independent failure modes.
- 2.9 Multi-valued dependency $R.A \twoheadrightarrow R.B$ holds in R iff the set of B values matching a given (A, C) pair in R depends on both A and C values.
- 2.10 2-phase locking protocols ensures freedom from deadlock.

- 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	DDL	A.	Specified a predicate that must be satisfied by every tuple in relation
3.2	Normalization	B.	Authentication
3.3	Outer-join	C.	Specifies a condition that is not to be Checked
3.4	Check() clause in SQL	D.	Data Dictionary
3.5	Dashed Ellipses in ER diagram	E.	Removes Redundancy
3.6	DBA	F.	Derived attributes
3.7	Shadow Paging	G.	Multi-valued attributes
3.8	Relational Algebra	H.	No-force approach
3.9	Hierarchical model	I.	Tables
3.10	Deferred Update	J.	Tree structure
		K.	No-steal approach
		L.	Deals with missing information
		M.	Database made up of fixed size pages
		N.	Used to declare database schema
		O.	Procedural

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.	Tuples	B.	Acyclic	C.	Recovery management
D.	Closure	E.	Union	F.	Primary
G.	Physical	H.	Hierarchical	I.	Relations
J.	Specialization	K.	Composite	L.	Weak entity set
M.	Partitioning	N.	Aggregation	O.	Integrity Constraints

- 4.1 The process of designating sub-grouping within an entity set is_____.
- 4.2 An entity set that does not have sufficient attributes to form a primary key is known as _____.
- 4.3 A relation that is not part of logical model but is made visible to a user as a virtual relation is called a(n) _____.
- 4.4 Durability is implemented in _____ component of database.
- 4.5 The UPDATE command in SQL is used to modify attribute values of one or more selected _____.
- 4.6 A foreign key creates a(n) _____ relationship between two associated entities.
- 4.7 The _____ of a query consists of the tuples, which may be assigned to the free variables of the well-formed formula.
- 4.8 A key consisting of more than one column is called a(n) _____.
- 4.9 A(n) _____ structure is a logical data model that arranges data according to some natural hierarchy on a one-to-one basis.
- 4.10 A locking protocol ensures conflict serializability, iff for all legal schedules, the associated relation is _____.

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

5.

- a) Explain the following Database terms with the help of an example-
- i) Data Independence
 - ii) Domain
 - iii) Foreign Key
 - iv) Cardinality
 - v) Referential Integrity
- b) Explain the purpose of triggers in SQL with the help of an example.

[(2x5)+5]

6.

- a) An insurance company wishes to create a database to keep track of its operations. A policy may be held by many policy holders. An agent sells policies; with all policies being sold by only one agent. A policyholder is serviced by only one agent. An agent normally works in one office, although some agents work from home. An office may have several agents. Policy details held include the policy number, policy date, policy type and insurance amount. Policyholder's details include policyholder number, name, and address and phone number. Agent details include agent code, agent name, salary and commission (2% of total policy insurance amount sold). Office details include the office name, office address, office phone number and manager name.
- i) State the entity types with their identifier and the relationships, using above description.(State any assumption)
 - ii) Construct an ER diagram and use the relational mapping rules to derive a suitable relational schema.
- b) Explain, why Relational model is more popular than the other two models.

[(4+7)+4]

7.

- a) Describe in brief the various access control policies that are to be determined in light of the security features provided by the DBMS.
- b) Describe in brief the recovery techniques based on immediate update.
- c) Explain 3rd normal form with suitable example.

(6+6+3)

8.

- a) Consider the relation R (A, B, C, D, E, F, G) with following set of functional dependencies-
- $\{A \rightarrow CE, EF \rightarrow ADG, BG \rightarrow CEF, BF \rightarrow AD, D \rightarrow ABG\}$
- i) Compute the closures of following sets:
 - 1.1) D
 - 1.2) AB
 - ii) Find a loss less BCNF decomposition of above schema. If BCNF decomposition is not dependency preserving, find 3NF decomposition.
- b) What is concurrency control? Explain with suitable example.

(5+10)

9.

- a) A schema describing theatres, cities where they are located and shows is defined as follows-

CITY (Name, State, Country)

THEATRE (Name, City, State, Capacity)

SHOW (Title, Artist, Hall, Attendance)

Write the following queries in both 1) **SQL** and 2) **Relational Algebra**-

- i) Find names of artists who performed before at least 5000 people, together with cities where those performances took place.
 - ii) Find all states in India where Mr. X has performed.
 - iii) List all artists who never played in Delhi.
 - iv) Find the name of theatres in Bombay whose capacity exceeds 5000.
- b) Explain in brief ACID properties of a database transaction.
- c) Explain the functions of Database Administrator.

[(2x4)+4+3)