B2.2-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS (DBMS)

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.** (1x10)

1.1 A database user manually notes that "The file contains two hundred records, each record containing nine fields". Translating this statement in database terminology means
A) 200 attributes and 9 rows
B) 200 rows 9 tuples
C) 200 tuples and 9 attributes
D) 200 attributes and 9 tuples

1.2 Given the following relation schemas
EMPLOYEE (EMP_CODE, EMP_NAME, JOB_CODE)
PLAN (PLAN_CODE,PLAN_DESCRIPTION)
BENEFIT(EMP_CODE,PLAN_CODE)
Attribute PLAN_CODE in relation BENEFIT is
A) Primary Key
B) Foreign Key
C) Candidate Key
D) Alternate Key

1.3 In **Question 1.2** above, what is the cardinality of relationship between EMPLOYEE and PLAN?
A) One to One
B) One to Many
C) Many to One
D) Many to Many

1.4 "A Course is a prerequisite of another Course" represents
A) Ternary relationship
B) Recursive relationship
C) Strong relationship
D) Weak relationship

1.5   Given a relation R(A,B,C,D) and following functional dependencies
        A,B ------$\rightarrow$ CD,   C-$\rightarrow$D,   and C--$\rightarrow$ B
        What is the highest normal form of relation R?
A)   2NF
B)   3NF
C)   BCNF
D)   1NF

1.6   How would you describe a condition in which one attribute determines another attribute
        when neither attribute is part of the primary key
A)   Partial dependency
B)   Transitive dependency
C)   Full Functional dependency
D)   Intransitive Dependency

1.7   Three level architecture of the database system provides
A)   Data Dependency
B)   Data Manipulation Facility
C)   Data Abstraction
D)   None of the above

1.8   Log is used by
A)   Concurrency Control Component
B)   Query Processing Component
C)   Recovery Component
D)   None of the above

1.9   DROP TABLE statement is a
A)   DML statement
B)   DDL statement
C)   Query statement
D)   None of the above

1.10   ON DELETE and ON UPDATE statements are associated with
A)   Primary Key
B)   Foreign Key
C)   Alternate Key
D)   Surrogate Key

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.** (1x10)

2.1 UPDATE statement is used to change the schema of the table.
2.2 Number of participating entity types in a relation defines the degree of the relationship.
2.3 Storing the same data multiple times leads to inconsistency.
2.4 Specialization is the process of creating sub entity types from an existing entity type.
2.5 Logical data independence is capacity to change physical schema without changing conceptual schema.
2.6 "Primary Key cannot take NULL values", is known as Key Constraint.
2.7 COUNT operation is an aggregate function.
2.8 Creation of Indexes makes sorting of records operation efficient.
2.9 Database administrator is responsible for performance monitoring of the database system.
2.10 Normalization is a Bottom Up approach for designing databases.

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.** (1x10)

	X		Y
3.1	When the database is used by the entire organization and support usually hundreds of users it is called	**A.**	JOIN operation
3.2	Second Normal Form of relations is related to	**B.**	IBM company
3.3	DB2 is a database management System of	**C.**	System Log
3.4	Information from two or more than two tables can be combined using	**D.**	Enterprise Database
3.5	The condition that each entity instance of an entity participates in a relationship is known as	**E.**	Views
3.6	Users are provided only a selected portion of the complete table using	**F.**	Union compatibility of relations
3.7	Performing set operations on two relations require	**G.**	Full Functional Dependency
3.8	A sub query that executes once for each row in outer query is called	**H.**	Total Participation
3.9	If a transaction T1 is being executed and is using a data item X that data item can not be accessed by any other transaction T2, T3, … Tn until T1 ends, is known as	**I.**	Lock
3.10	It guarantees the exclusive use of a data item to a transaction	**J.**	Isolation property
		K.	Disjoint
		L.	Checkpoints
		M.	Correlated nested query

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.** (1x10)

A.	Data Dictionary	**B.**	Exists clause	**C.**	Authorized Accesses
D.	Having Clause	**E.**	Degree	**F.**	Group By
G.	Select operation	**H.**	Access privileges	**I.**	Count
J.	Rollback	**K.**	Project operation	**L.**	In operation
M.	Serializability				

4.1 Condition specified in the _____ is applicable on the results of aggregate function which is applied to a group of tuples.

4.2 _____ undo any changes since the last Commit.

4.3 _____ is used to check whether a sub query returns any rows.

4.4 _____ is itself a data base of predefined nature.

4.5 Number of attributes in a table defines its _____.

4.6 One of the main responsibilities of database administrator is to allow _____ to the database.

4.7 Grant/Revoke SQL statements are used to define _____.

4.8 _____ function is used to obtain the number of not null values of an attribute or number of rows.

4.9 _____ clause is valid only when used in conjunction with one of the SQL aggregate functions.

4.10 A join operation of two relation states is equivalent to applying Cartesian product of two relations followed by a _____ on the equality of common attribute values.

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

5.

a) What is data redundancy? Explain with the help of an example why it is an inherent feature in the file system?

b) Given the following table:

Project_Code	Project_Manager	Manager_Phone	Manager_Address	Project_Bid_Price
21-5Z	Harshit Mathur	9945873206	21/5, Karol Bagh, Delhi	345423000.00
25-2D	Jagdish Sharma	9872054329	34-A,TagoreTown, Kanpur, UP	651237000.00
25-5A	Gagan Saxena	9316671905	1/304, Vikas Nagar, Lucknow	321876000.00
25-9T	Harshit Mathur	9945873206	21/5, Karol Bagh, Delhi	980562000.00
27-4Q	Jagdish Sharma	9872054329	34-A,TagoreTown, Kanpur, UP	650428000.00
29-2D	Harshit Mathur	9945873206	21/5, Karol Bagh, Delhi	820213000.00
31-7P	Varsha Deb	9910076842	56, D.B.Gupta Road, Kolkata	450987000.00

i) What problem would you encounter if you want to produce a listing by city? How would you solve this problem by altering the table structure?

ii) What data redundancies do you detect? Suggest the change in table schema to solve this problem.

c) Given the following tables:

DIRECTOR

DIR_NUM	DIR_NAME	DIR_DOB
100	Arvind Gaur	30/6/43
101	Faizal Alkazi	12/8/50
102	Anuradha Kapoor	21/9/62

PLAY

PLAY_CODE	PLAY_NAME	DIR_NUM
1001	Jivit ya Mrit	102
1002	Bade Bhai Saab	101
1003	Galib in Delhi	102
1004	Safarnama	100
1005	Aadhe Adhure	101
1006	Konark	101
1007	Adhoori Kahani	NULL

i) Identify the Primary and Foreign Keys of both the tables.

ii) Do the tables exhibit Entity and Referential Integrity Constraints? Explain.

iii) Draw the entity relationship diagram to show the relationship between director and play. Specify the cardinality and participation constraints also.

(5+[2+2]+[2+2+2])

6. Consider the tables given in **Question No. 5. c)**, write the following queries in SQL.

i) Display the names of plays directed by Faizal Alkazi.

ii) Display the number of plays directed by each director.

iii) Create a view DIR_PLAY based on the above two tables and has fields DIR_NUM, DIR_NAME, PLAY_NAME.

iv) Write the DDL statement to create the table PLAY. Specify primary and foreign keys also in the definition. Choose appropriate data type for each attribute.

v) Write SQL statement to insert a tuple (1008, 'Sara AAkash', 107) in the table PLAY. What will be the result of this operation? Explain.

vi) Write SQL statement(s) to change the schema of the table PLAY to add an attribute Duration which is a composite attribute comprising of hour and minute fields.

(2+2+3+3+2+3)

7.

a) Use the following business rules to draw an entity relationship diagram. Specify cardinality ratios and participation constraints clearly. You need not specify attributes.
  i) A department employs many employees but each employee is employed by only one department.
  ii) Some employees known as 'rovers', are not assigned to any department.
  iii) A division operates many departments, but each department is operated by one division.
  iv) An employee may be assigned many projects, and a project may have many employees assigned to it.
  v) A project must have at least one employee assigned to it.
  vi) One of the employees manages each department, and each department is managed by only one employee.
  vii) One of the employees runs each division and each division is run by only one employee.

b) An employee table has to store emp_no, emp_name and skills attributes. Attribute skill is a multi valued attribute. In relational model a table can not have multiple values for an attribute for one entity instance. Suggest a database schema to store the relevant information about employees.

c) With the help of an example illustrate the usefulness of
  i) Logical Data Independence and
  ii) Physical data independence.

(6+3+[3+3])

8.

a) Given a relation R(A,B,C,D,E,F,G) and the following functional dependencies
  A---→D; C--→ B;   AB ---→ C,E,F and E---→G
  i) Identify the primary key of the relation.
  ii) Decompose R such that each relation is at least in 2NF.
  iii) Decompose R such that each relation is at least in 3NF.
  iv) Decompose each relation such that each relation is in BCNF.

b) Explain insertion, deletion and update anomalies with the help of an example.

([2.5x4]+5)

9.

a) Given two tables R and S:

R				S		
A	B	C		D	E	F
3	1	5		2	10	6
5	6	2		5	7	8
7	2	5		6	5	4
9	3	3		9	3	3

Find the result of the following relational algebraic statements. Attribute C and D of relations R and S respectively represent the same attribute.
  i) R equi join S
  ii) R Left outer join S
  iii) R right outer join S
  iv) R full outer join S
  v) R U S
  vi) R-S

b) Explain briefly how checkpoints are used to reduce the amount of operations that are to be UNDONE in a recovery phase.

c) Write the SQL statement for (i) Creating a user account "student5"   (ii) and granting it the permission for all DML operations.

([1.5x6]+4+2)