B2.2-R4: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

अवधि: 03 घंटे **अधिकतम अंक: 100**

DURATION: 03 Hours **MAXIMUM MARKS: 100**

ओएमआर शीट सं.: **OMR Sheet No.:**						

रोल नं.: **Roll No.:** | | | | | | |

उत्तर-पुस्तिका सं.: **Answer Sheet No.:** | | | | | | |

परीक्षार्थी का नाम: **परीक्षार्थी के हस्ताक्षर**:

Name of Candidate: _____; Signature of candidate: _____

परीक्षार्थियों के लिए निर्देश:	**Instructions for Candidate:**
कृपया प्रश्न-पुस्तिका**,** ओएमआर शीट एवं उत्तर-पुस्तिका में दिये गए निर्देशों को ध्यान पूर्वक पढ़ें।	Carefully read the instructions given on Question Paper, OMR Sheet and Answer Sheet.
प्रश्न-पुस्तिका की भाषा अंग्रेजी है। परीक्षार्थी केवल अंग्रेजी भाषा में ही उत्तर दे सकता है।	Question Paper is in English language. Candidate can answer in English language only.
इस मॉड्यूल/पेपर के **दो भाग** है। **भाग एक** में चार प्रश्न और **भाग दो** में पाँच प्रश्न है।	There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions**.**
भाग एक "वैकल्पिक" प्रकार का है जिसके कुल अंक 40 है तथा **भाग दो**, "व्यक्तिपरक" प्रकार है और इसके कुल अंक 60 है।	**PART ONE** is Objective type and carries 40 Marks. **PART TWO** is subjective type and carries 60 Marks.
भाग एक के उत्तर, इस प्रश्न-पत्र के साथ दी गई **ओएमआर उत्तर-पुस्तिका** पर**,** उसमें दिये गए अनुदेशों के अनुसार ही दिये जाने है। **भाग दो** की उत्तर-पुस्तिका में **भाग एक** के उत्तर **नहीं** दिये जाने चाहिए।	**PART ONE** is to be answered in the **OMR ANSWER SHEET** only, supplied with the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book for **PART TWO**.
भाग एक के लिए अधिकतम समय सीमा **एक घण्टा** निर्धारित की गई है। **भाग दो** की उत्तर-पुस्तिका, **भाग एक** की उत्तर-पुस्तिका जमा कराने के पश्चात दी जाएगी। तथापि, निर्धारित एक घंटे से पहले **भाग एक** पूरा करने वाले परीक्षार्थी **भाग एक** की उत्तर-पुस्तिका निरीक्षक को सौंपने के तुरंत बाद, **भाग दो** की उत्तर-पुस्तिका ले सकते हैं।	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.**
परीक्षार्थी, उपस्थिति-पत्रिका पर हस्ताक्षर किए बिना एवं अपनी उत्तर-पुस्तिका, निरीक्षक को सौंपे बिना, परीक्षा हाल नहीं छोड़ सकता हैं। ऐसा नही करने पर, परीक्षार्थी को इस मॉड्यूल/पेपर में अयोग्य घोषित कर दिया जाएगा।	**Candidate cannot leave the examination hall/room without signing on the attendance sheet and handing over his Answer sheet to the invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
प्रश्न-पुस्तिका को खोलने के निर्देश मिलने के पश्चात एवं उत्तर देने से पहले उम्मीदवार यह जाँच कर यह सुनिश्चित कर ले कि प्रश्न-पुस्तिका प्रत्येक दृष्टि से संपूर्ण है।	After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question booklet is complete in all respect.

जब तक आपसे कहा न जाए तब तक प्रश्न-पुस्तिका न खोलें।

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

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 "OMR" answer sheet supplied with the question paper, following instructions therein. (1x10)

1.1 Data Abstraction is the characteristic that allows
A) Program – data independence
B) Program – operation independence
C) Both A) & B)
D) None of the above

1.2 A type of query which is placed within a WHERE or HAVING clause of another query is called
A) multi-query B) super-query
C) sub-query D) semi-query

1.3 Database locking concept is used to solve the problem of
A) Lost Update
B) Inconsistent data
C) Uncommitted dependency
D) All of the above

1.4 The shadow directory contains
A) Entries to the most recent or current database pages
B) Copies of all database pages
C) Entries of pages not written for the longest period
D) None of the above

1.5 A lock that allows concurrent transactions to access different rows of the same table is called
A) Row-level lock B) Field –level lock
C) Table-level lock D) Critical lock

1.6 A functional dependency between two or more non-key attributes is called
A) Transitive dependency
B) Partial – transitive dependency
C) Functional dependency
D) Partial – functional dependency

1.7 Which one of the following statements is false?
A) Data dictionary is normally maintained by DBA.
B) Data elements in database can be modified by changing the data dictionary.
C) Data dictionary contains the name and description of each data element.
D) Data dictionary is a tool used exclusively by DBA.

1.8 Which of the following is a record – based logical model?
A) Hierarchical model B) Object-oriented model
C) Functional Data Model D) None of the above

1.9 Which two files are used during the operations of the DBMS?
A) DML and query language
B) Data dictionary and query language
C) Query language and utilities
D) Data dictionary and transaction log

1.10 An instance of relational schema R (A, B, C) has distinct values of A including NULL values. Which one of the following is true?
A) A is a candidate key
B) A is not a candidate key
C) A is a primary Key
D) Both A) & C)

2. Each statement below is either TRUE or FALSE. Choose the most appropriate one and enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein. (1x10)

2.1 Data independence refers to the fact that databases are defined separately from the information systems and application programs that will use them.

2.2 Cardinality of a relationship means the number of attributes in the relation.

2.3 Union, Intersection and Set Difference are not binary operations.

2.4 The DBA is the co-ordinator between the DBMS and application programs.

2.5 'AS' clause is used in SQL for Rename Operation.

2.6 The database schema is written in Data Control Language.

2.7 In SQL, NULL is the same as zero.

2.8 In E-R diagram derived attributes are represented by dashed ellipse.

2.9 RAW datatype can store unstructured data.

2.10 Locks that are placed expecting a conflict are termed pessimistic locks.

ROUGH WORK SPACE:

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 "OMR" answer sheet supplied with the question paper, following instructions therein. (1x10)

X		Y	
3.1	Normalization	**A.**	Database schema
3.2	Deadlock	**B.**	Table
3.3	Database Recovery	**C.**	Primary Key
3.4	Set of values	**D.**	Relationship
3.5	Two-Phase locking	**E.**	Starvation
3.6	Join	**F.**	Functional dependency
3.7	Referential Integrity	**G.**	Domain
3.8	Related records	**H.**	Multiple tables
3.9	Strong entity set	**I.**	ARIES
3.10	Data dictionary	**J.**	Growing and shrinking phase
		K.	Shadow copy
		L.	Foreign Key
		M.	Meta data

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Choose the most appropriate option, enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein. (1x10)

A.	Concurrency control	**B.**	Data Validation	**C.**	Materialized View
D.	Database instance	**E.**	Implicit	**F.**	AGGREGATE
G.	Phantom Reads	**H.**	5NF	**I.**	Shared locks
J.	Deadlock	**K.**	Schema	**L.**	ACID
M.	SELECT				

4.1 _____ is allowed by "Repeatable Read Isolation".

4.2 _____ is the process within the database design of ensuring that data entered into a database meets validation rules.

4.3 _____ query displays a subset of data from one table based on specified criteria.

4.4 A lock placed automatically by the DBMS is called _____ lock.

4.5 Measures that are taken to prevent one user's work from inappropriately influencing another user's work are called _____.

4.6 Join dependency is associated with _____.

4.7 MIN, MAX, AVG, SUM are all examples of _____ functions.

4.8 The properties of a transaction are termed _____ properties.

4.9 Snapshot of the database at a given instance in time is referred to as _____.

4.10 Virtual existence of table that are kept up to date is referred to as _____.

ROUGH WORK SPACE:

PART TWO
(Answer any FOUR questions)

5.

a) Discuss the main categories of data models.

b) Describe the three-schema architecture. Justify the need for mappings between the schema levels with a suitable illustration.

(6+9)

6.

a) Consider the following relational schema:

Student(<u>snum: integer</u> (P), sname: varchar , major: varchar, level: varchar, age: integer)
Class(name: varchar(P), meets at: varchar, room: varchar, <u>fid: integer</u>)
Enrolled(<u>snum:</u> integer (C), cname: varchar(C))
Faculty(<u>fid: integer</u>(P), fname: varchar, <u>deptid:</u> integer)

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i) Find the names of all Juniors (level = JR) who are enrolled in a class taught by H.Sam.

ii) Find the names of all classes that either meet in room R128 or have five or more students enrolled.

iii) For each level, print the level and the average age of students for that level.

b) What is dependency preservation? Consider the relation SJT

{student,subject,teacher}
with the following set of FDs :
{student,subject}->teacher
{teacher}->subject

i) Identify the candidate keys.

ii) Is this relation in BCNF? Justify your answer.

(9+6)

7.

a) The Prescriptions-R-X chain of pharmacies has ordered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here is the information that you gather:
- Patients are identified by an SSN, and their names, addresses, and ages must be recorded.
- Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.
- Each pharmaceutical company is identified by name and has a phone number.
- For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
- Each pharmacy has a name, address, and phone number.
- Every patient has a primary physician. Every doctor has at least one patient.
- Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.
- Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.
- Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

Draw an ER diagram that captures the preceding information. Identify any constraints not captured by the ER diagram.

b) Discuss the deferred update and immediate update recovery technique.

(9+6)

8.

a) Discuss the relational integrity constraints supported in Relational database. Explain each constraint with suitable example.

b) Enumerate the Discretionary Access Control based on Privilege Grant and Revoke in DBMS systems.

c) Explain the concept used in Shadow Paging.

(4+5+6)

9.

a) Explain Shared/Exclusive locking mechanism.

b) Enumerate the Basic and Aggregate operations in Relational Algebra.

c) Illustrate the query language in Tuple Relational Calculus (TRC) with suitable examples.

(6+5+4)

ROUGH WORK SPACE:

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