A7-R5 : DATABASE TECHNOLOGIES

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 :
Name of Candidate : _____

परीक्षार्थी के हस्ताक्षर :
Signature of Candidate : _____

परीक्षार्थियों के लिए निर्देश :	**Instructions for Candidate :**
कृपया प्रश्न-पुस्तिका, ओएमआर शीट एवं उत्तर-पुस्तिका में दिये गए निर्देशों को ध्यानपूर्वक 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** हैं। **भाग एक** में **चार** प्रश्न और **भाग दो** में **पाँच** प्रश्न हैं।	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 का 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, **ओएमआर उत्तर-पुस्तिका** पर ही दिये जाने हैं। **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. **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 पश्चात् 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** to the Invigilator.
परीक्षार्थी, उपस्थिति-पत्रिका पर हस्ताक्षर किए बिना और अपनी उत्तर-पुस्तिका, निरीक्षक को सौंपे बिना, परीक्षा हॉल/कमरा नहीं छोड़ सकते हैं। ऐसा नहीं 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/her 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 पश्चात् एवं उत्तर लिखना आरम्भ करने से पहले उम्मीदवार जाँच कर यह सुनिश्चित कर लें कि प्रश्न-पुस्तिका प्रत्येक दृष्टि से संपूर्ण है।	After receiving the instruction to open the booklet and before starting to answer 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 What type of join is needed when you wish to include rows that do not have matching values ?

(A) Equi-join

(B) Natural join

(C) Outer Join

(D) All of the mentioned

1.2 Checkpoints are a part of :

(A) Recovery measures.

(B) Security measures.

(C) Concurrency measures.

(D) Authorization measures.

1.3 The language that requires a user to specify the data to be retrieved without specifying exactly how to get it is :

(A) Procedural DML.

(B) Non-Procedural DML.

(C) Procedural DDL.

(D) Non-Procedural DDL.

1.4 The rule that a value of a foreign key must appear as a value of some specific table is called a :

(A) Referential constraint.

(B) Index.

(C) Integrity constraint.

(D) Functional dependency.

1.5 The clause in SQL that specifies that the query result should be sorted in ascending or descending order based on the values of one or more columns is :

(A) View

(B) Order by

(C) Group by

(D) Having

1.6 What is a disjoint less constraint ?

(A) It requires that an entity belongs to no more than one level entity set.

(B) The same entity may belong to more than one level.

(C) The database must contain an unmatched foreign key value.

(D) An entity can be joined with another entity in the same level entity set.

1.7 It is an abstraction through which relationships are treated as higher level entities ?

(A) Generalization.

(B) Specialization.

(C) Aggregation.

(D) Inheritance.

1.8 What is data integrity ?

(A) It is the data contained in database that is non redundant.

(B) It is the data contained in database that is accurate and consistent.

(C) It is the data contained in database that is secured.

(D) It is the data contained in database that is shared.

1.9 The operation which is not considered a basic operation of relational algebra is :

(A) Join.

(B) Selection.

(C) Union.

(D) Cross product.

1.10 Which of the following is a NoSQL Database Type ?

(A) SQL

(B) Document databases

(C) JSON

(D) All of the mentioned

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 Update anomaly is not a consequence of concurrent operations.

2.2 Secondary Indexes are always available in MongoDB.

2.3 When R^S = Ø , then the cost of computing R >< S is the same as R × S.

2.4 If a transaction T has obtained an exclusive lock on item Q, then T can write Q but not read Q.

2.5 MongoDB supports a complete backup solution and full deployment monitoring, with : MMS.

2.6 If two relations R and S are joined, then the non matching tuples of both R and S are ignored in inner join.

2.7 In an E-R, Y is the dominant entity and X is a subordinate entity. Then Operationally, if X is deleted, so is Y.

2.8 If R (A, B, C, D) is a relation. Then A → B, B → CD does not have a lossless join dependency preserving BCNF decomposition.

2.9 With finer degree of granularity of locking a high degree of concurrency is possible.

2.10 In SQL, testing whether a sub query is empty is done using EXISTS.

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	Which is not the relational algebra operator ?	**A**	4NF
3.2	Composite attribute	**B**	Attribute that can have more values
3.3	How can a tuple be divided in a relational schema ?	**C**	Shared lock
3.4	Multivalued Attribute	**D**	Attribute whose value is calculated from other attributes
3.5	The problem caused by independent multivalued dependencies is eliminated in which of the normal form ?	**E**	Set difference
3.6	Trigger is	**F**	3NF
3.7	A SQL command used to add a new record to a table within a database.	**G**	Attribute that can be further subdivided to yield additional attributes
3.8	Transparent DBMS	**H**	Domains
3.9	Refers to the validity, accuracy, and consistency of the data in a database.	**I**	It is a procedural code which is executed automatically in response to certain events on a particular table or view
3.10	Read lock	**J**	Data Integrity
		K	Cannot hide sensitive information from users.
		L	Update
		M	temporary Buffer

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	Tree like structure	**B**	replication	**C**	double lines
D	1 : 1	**E**	Committed	**F**	one less
G	same	**H**	M : 1	**I**	Complex logical relationship
J	Query Tree	**K**	idempotent	**L**	record lock
M	transaction manager				

4.1 A transaction is in _____ state after the final statement has been executed.

4.2 In E-R Diagram total participation is represented by _____.

4.3 _____ is not a characteristic of a relational database model.

4.4 The graphical representation of a query is _____.

4.5 Most NoSQL databases support automatic _____ meaning that you get high availability and disaster recovery.

4.6 In b-tree the number of keys in each node is _____ than the number of its children.

4.7 In a multi-user database, if two users wish to update the same record at the same time, they are prevented from doing so by _____.

4.8 If both the functional dependencies : $X \rightarrow Y$ and $Y \rightarrow X$ hold for two attributes X and Y then the relationship between X and Y is _____.

4.9 For correct behaviour during recovery, undo and redo operation must be _____.

4.10 The part of a database management system which ensures that the data remains in a consistent state is _____.

PART TWO
(Answer any FOUR questions)

5. (a) What is DBMS ? List out its advantages over File Systems.

(b) Differentiate between Physical and Logical database Independence in detail.

(c) Consider an E-R diagram in which the same entity set appears several times. Why is allowing this redundancy a bad practice that one should avoid whenever possible ?

(d) Define Key constraints and Referential constraints. Explain the concept of Foreign Key with a suitable example. **(3+3+4+5)**

6. (a) Consider the insurance database where the primary keys are underlined.

Person(Driver_ID, Name, Address)
Car(License, Model, Year)
Accident(Report_Number, Date, Location)
Owns(Diver_ID, License)
Participated(Driver_ID, Car, Report_Number, Damage_Amount)

Construct the following SQL queries for this relational database.

(i) Find the total number of people who owned cars that were involved in accidents in 2013.

(ii) Add a new accident to the database; assume any values for required attributes.

(iii) Update the damage amount for the car with license number "AABB2000" in the accident with report number "AR2129" to Rs : 3000/-.

(b) Explain the overall Architecture of DBMS.

(c) Define the SQL Joins and also explain their classifications in short. **(6+6+3)**

7. (a) What are MVD and Join Dependency ?

(b) Consider the following attributes for an investment firm database.

B – Broker, O - Office of a broker, I – Investor, S - Stock, Q - Quantity of stock owned by an investor, D - dividend paid by a stock.

Hence, the overall schema is R = (B, O, I, S, Q, D). Assume that the following FD's are required to hold this database.

$I \rightarrow B$, $IS \rightarrow Q$, $B \rightarrow O$, $S \rightarrow D$.

(i) List all candidate keys for R.

(ii) Give a lossless-join decomposition of R into BCNF.

(iii) Give a lossless-join decomposition of R into 3NF preserving FD. Is your answer in BCNF ? Justify. **(4+[3+4+4])**

8. (a) Explain View serializability in detail, Explain the relationship between the view serializability and conflict serializability schedules.

(b) Compare the shadow paging recovery scheme with the log based recovery.

(c) Describe time-stamp protocol, how does system guarantee time-stamp ? Describe the time-stamp concurrency control techniques in detail. Does this technique satisfies cascadeless and recoverability properties. **(5+4+6)**

9. (a) What are the pros and cons of a graph database under NoSQL databases ?

(b) Write down the differences between NoSQL and RDBMS ? List some of the features of NoSQL ?

(c) Explain the pipeline operations.

(d) What is MangoDB and MapReduce explain in detail. **(3+3+4+5)**

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SPACE FOR ROUGH WORK

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