

MCA (Revised) / BCA (Revised)

Term-End Examination

February, 2021

MCS-023 : INTRODUCTION TO DATABASE
MANAGEMENT SYSTEMS

Time : 3 hours

Maximum Marks : 100

(Weightage : 75%)

Note : Question no. 1 is **compulsory**. Attempt any **three** questions from the rest.

1. (a) Determine the output when the following operations are applied on Relation R_1 , R_2 and R_3 given below :

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| | | | | | | | | | | | |
|---------|-------|-------|--|---------|-------|-------|--|---------|---|--|---------|
| $R_1 :$ | A | B | | $R_2 :$ | X | Y | | $R_3 :$ | A | | → empty |
| | a_1 | b_1 | | | a_1 | b_1 | | | | | |
| | a_2 | b_2 | | | a_7 | b_7 | | | | | |
| | a_3 | b_3 | | | a_2 | b_2 | | | | | |
| | a_4 | b_4 | | | a_4 | b_4 | | | | | |

- (i) Union ($R_1 \cup R_2$)
- (ii) Intersection ($R_1 \cap R_2$)
- (iii) Difference ($R_1 - R_2$)
- (iv) Cartesian Cross Section ($R_1 \times R_2$)
- (v) Division ($R_1 \div R_3$)

(b) How do weak entities differ from strong entities ? Discuss with the help of an example. Briefly discuss the role of keys in identification of the entity type, i.e. weak or strong. 5

(c) What do you understand by functional dependency in a Relational DBMS ? For the relation given below, check whether the given functional dependencies hold or not. Give proper justification. 5

| J | K | L |
|---|---|---|
| x | 1 | 2 |
| x | 1 | 3 |
| y | 1 | 4 |
| y | 1 | 3 |
| z | 2 | 5 |
| p | 4 | 7 |

(i) $J \rightarrow K$

(ii) $K \rightarrow J$

(iii) $J, K \rightarrow L$

(iv) $K, L \rightarrow J$

- (d) List the properties of concurrent transactions. Consider the concurrent schedule of the transactions T_1 and T_2 given below :

| <u>Schedule</u> | <u>T_1</u> | <u>T_2</u> | <u>SUM</u> |
|---------------------|-------------------------|-------------------------|------------|
| T_1 : Read(Sum) | Read(Sum) | | 500 |
| T_1 : Sum=Sum-100 | Sum=Sum-100 | | |
| T_2 : Read(Sum) | | Read(Sum) | |
| T_2 : Sum=Sum+500 | | Sum=Sum+500 | |
| T_1 : Write(Sum) | Write(Sum) | | |
| T_2 : Write(Sum) | | Write(Sum) | |

Referring to the schedule above, answer the following questions :

- 5
- (i) Which property of transaction is violated ?
- (ii) Identify the final status of sum.
- (iii) The given schedule contributes to which problem in databases ?
- (e) What are the advantages and disadvantages of distributed databases ? 5
- (f) What is the difference between DBMS and RDBMS ? Under what situations is it better to use File-based System than Database System ? 5
- (g) Explain database recovery using system log with the help of an example. 5

- (h) Explain the following terms : 5
- (i) Candidate key
 - (ii) Primary key
 - (iii) Foreign key
 - (iv) Super key
 - (v) Alternate key
2. (a) What are checkpoints ? Discuss the role of checkpoints in database recovery. Give suitable example in support of your discussion. 10
- (b) Explain 3NF. Discuss the Insert, Delete and Update anomalies associated with 3NF. 10
3. Differentiate the following : 20
- (i) Centralized and Distributed DBMS
 - (ii) Deadlock avoidance and Deadlock prevention protocols
 - (iii) 2 Phase locking and 2 Phase commit
 - (iv) 3NF and BCNF
4. Write short notes on following : 20
- (i) Precedence graph for serializability check
 - (ii) Types of Indexes in DBMS
 - (iii) Data fragmentation and its objectives
 - (iv) Problems of serial schedule and serializable schedule

5. (a) Can we use Binary Search Tree (BST) as Indexes ? Justify. If we use BST as Index, then what can be the possible problems ? What will be the solution for those problems ? 10
- (b) Consider “Library Management System” which keeps the following tables :
- Book (isbn_no, title, author, publisher, edition, year)
- Book_Access (access_no, isbn_no, date_of_purchase)
- Member (m_name, m_id, m_address, m_phone)
- Issue_Return (access_no, m_id, expected_return_date, actual_return_date)
- Specify the following queries in SQL : 10
- (i) Find m_id and m_name of the members who have got at least one book issued to themselves.
 - (ii) List the book details for the books which were purchased after January 2017.
 - (iii) List all the books on title “Databases”. This list should be sorted on author’s name.
 - (iv) Find the members who have not got any book issued.