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MCS-023

M. C. A. (REVISED)/B. C. A. (REVISED)

Term-End Examination

December, 2022

MCS-023 : INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Time : 3 Hours *Maximum Marks : 100*

Weightage : 75%

Note : (*i*) *Question No.* ***1*** *is compulsory.*

(*ii*) *Attempt any* ***three*** *questions from the rest.*

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1. (a) State the two integrity rules. In the following two relations : customer and sales-order, state which if any, of the integrity rules are violated, when the following tuples (rows) from (i) to (iv) are added to the sales-order relation : 8

Customer		
Cust-No	Name	Address
C15	NM-1	ADR-1
C16	NM-2	ADR-2

Sales-Order		
Order-No	Date	Cust-No

(i) <013, 2/6/2019, C15>

(ii) <014, 3/6/2019, NULL>

(iii) <015, 4/6/2019, C17>

(iv) <Null, 5/6/2019, C16>

The underlined attributes are primary keys in the above relations.

(b) Is the following schedule serializable ? Explain. 6

T1	T2
read (X);	
	write (X);
read (X);	
write (Y);	
Commit	
	Commit

(c) Define 3NF. Justify whether the following employee relation is in 3NF or not : 6

employee (emp_code, emp_name, deptt, salary, project_no, termination_date) where Project_No. → termination_date. The underlined attribute is PK.

If it is not in 3NF, convert it into 3NF.

(d) Consider the following relatives : Student (Stdid, Std_name, year_of_study, basic_stipend, dept_no.)

dept. (dept_no, dept_name, academic_block)

write SQL queries for the following : 6

(i) List std_name year_of_study, dept_name of all students whose name starts with "K".

(ii) Select names of all the students of Computer Science dept_name whose basic stipend is more than ` 8,000 per month.

(iii) Increase the basic stipend of 3rd-year engineering dept. by ` 3,000 per month.

(e) Design an E-R diagram for the following and also create its related tables : 6

"A faculty can teach many courses and a course can be taught by many faculty members."

(f) What are the different file organization techniques based on access key ? Describe the implementation mechanism for each technique. 4

(g) What are the rules to be followed for fragmenting the relation ? Create two horizontal fragments *frag 1* and *frag 2* on the state attribute Delhi and Haryana respectively of deposit relation given below. How are the horizontal fragments specified through algebraic operations ? 4

Deposit Relation

State	Acc_No.	Cust_Name	Deposit_Amt
Delhi	ACC 1	CN 1	5,000.00
Delhi	ACC 2	CN 2	10,000.00
Delhi	ACC 3	CN 1	6,000.00
Haryana	ACC 4	CN 2	15,000.00
Delhi	ACC 5	CN 4	12,000.00
Haryana	ACC 6	CN 4	15,000.00
Haryana	ACC 7	CN 2	25,000.00

2. (a) What will be the result of the following algebraic operations on the following relations R_1 and R_2 ? 6

(i) $R_1 \cup R_2$

(ii) $R_1 \cap R_2$

R_1 :	E_{id}	E_{name}
	E_{id1}	N1
	E_{id2}	N2
	E_{id3}	N3
	E_{id4}	N4
	E_{id5}	N5

R_2 :	E_{id}	E_{name}
	E_{id2}	N2
	E_{id4}	N4
	E_{id5}	N5

(b) What are order by clause and aggregate functions in SQL ? Consider the employee table having the following tuples :

Employee Table

ID	E-Name	Salary (`)	Age	Department
ID_1	N1	20,000	30	D1
ID_2	N2	15,000	35	D2
ID_3	N3	25,000	40	D2
ID_4	N4	30,000	35	D3
ID_5	N5	22,000	45	D4
ID_6	N6	27,000	42	D4

What will be the result of the following query from the above employee table of Q. 2(b) ? 6+2

(i) Select from employee ORDER by Salary Name.

(ii) Select Max (salary) from employee.

(iii) Select Avg (age) from employee.

(c) What are the advantages of having three levels of database architectures ? How are they related to data independence ? Discuss. 6

3. (a) Define primary, secondary and foreign keys. Identify the primary and foreign keys in the following relations : Students and School of studies : 6

Student		
Std_ID	**Program**	**Department**
ID_1	M. C. A.	D1
ID_2	M. C. A.	D1
ID_3	B. Sc.	D2
ID_4	M. A.	D3

School_f_studies		
Department	**Name**	**Location**
D1	Computer Science	C-Block
D2	Science	D-Block
D3	Social Science	F-Block

(b) Explain the meaning of the following two keywords :

Commit and *Rollback*. Write a code fragment for transferring money from account A to account B and show the uses of *Commit* and *Rollback*. Assume both accounts A and B exist in the bank. 6

(c) What are the reasons for occurrences of a deadlock in a database system ? Explain how does wait die scheme prevent in deadlock. Explain with the help of an example. 8

4. (a) (i) What is the use of locks in allowing multiple transactions running concurrently ? Why are multiple-mode locks preferable over a binary lock ? 4

The following is a schedule with the initial values of X and Y are 50 and 60 respectively :

Schedule No	T_1	T_2
1	LOCK X	

2	LOCK Y	
3	READ X	
4	X = X + 50	
5	Write X	
6	Unlock X	
7		Lock X
8		Lock Y
9	READ Y	
10	Y = Y – 40	
11	Write Y	
12	UNLOCK Y	
13		READ X
14		READ Y
15		Output = X + Y
16		Display Output
17		UNLOCK X
18		UNLOCK Y

Answer the following questions :

(ii) Whether the schedule is serializable or not ? Justify. 4

(iii) What will be the output value (schedule 16) ? 2

(iv) Whether the schedule Nos. 7 and 8 will be granted or not ? 2

(b) Discuss the basic model of database access control with the help of the following example : 8

Student (stdid, Name, e-mail, stipend, grade)

Assume that there are two types of users : student administrator and a student. Create a sample authorization matrix for the above relation.

5. (a) Write SQL commands for each of the following. Also illustrate the usage of each command : 10

(i) Creation of sequences

(ii) Outer Join

(iii) Creating views with check option

(iv) Database access permission to users

(b) State BCNF. What are the anomalies associated with a relation that is not in BCNF ? Why is BCNF considered stronger than 3NF ? Discuss with a suitable example. 10