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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.*

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

P. T. O.

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. \rightarrow 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