

**MCA (Revised)**  
**Term-End Examination**  
**June, 2011**

**MCS-023 : DATABASE MANAGEMENT SYSTEMS**

*Time : 3 hours*

*Maximum Marks : 100*

*(Weightage 75%)*

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

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1. (a) Explain following operators in Relational Algebra with the help of an example 5
- (i) Select      (ii) Project      (iii) Join
- (b) Analyse the following relations. Child (C-name, C-age, C-address) Parent (P-name, P-age, C-name, C-age) and identify the highest normal form possessed by them. If the relation is desired to be normalized then perform the task, otherwise justify with suitable arguments that "Normalization is not needed". 6
- (c) What are the advantages of using B tree as a structure for creating index ? 5

- (d) A concurrent schedule of transactions  $T_1$  and  $T_2$  acting on "SUM" is given below : 6

Schedule	$T_1$	$T_2$	Sum
-	-	-	100
Read <sub>1</sub> (Sum)	Read <sub>1</sub> (Sum)		
Sum = Sum + 10	Sum = Sum + 10		
Read <sub>2</sub> (Sum)		Read <sub>2</sub> (Sum)	
Write <sub>1</sub> (Sum)	Write <sub>1</sub> (Sum)		
Sum = Sum - 10		Sum = Sum - 10	
Write <sub>2</sub> (Sum)		Write <sub>2</sub> (Sum)	

Analyzing the given concurrent schedule performing following tasks.

- (i) What is the final value of "SUM" ?
- (ii) Verify that the given schedule is serializable or not. Explain.
- (e) Explain log based recovery scheme with the help of an example. 6
- (f) How client server databases differs from Distributed Databases ? Explain with the help of an example. 6
- (g) Define Functional Dependency (FD). Find the valid FD's in the following relation. 6

A	B	C	D
a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	d <sub>1</sub>
a <sub>2</sub>	b <sub>2</sub>	c <sub>2</sub>	d <sub>2</sub>
a <sub>3</sub>	b <sub>2</sub>	c <sub>3</sub>	d <sub>3</sub>
a <sub>4</sub>	b <sub>3</sub>	c <sub>4</sub>	d <sub>4</sub>

2. (a) Is it always beneficial to work with database systems, or some times filebase system is a better option ? Comment on it with suitable arguments. 3
- (b) Explain physical data independence and logical data independence. 4
- (c) Determine the output when following operations are applied on relations  $R_1$ ,  $R_2$  and  $R_3$  given below. 7

$R_1$ :	<table border="1" style="display: inline-table;"><tr><th>A</th><th>B</th></tr><tr><td>A<sub>1</sub></td><td>B<sub>1</sub></td></tr><tr><td>A<sub>2</sub></td><td>B<sub>2</sub></td></tr><tr><td>A<sub>3</sub></td><td>B<sub>3</sub></td></tr><tr><td>A<sub>4</sub></td><td>B<sub>4</sub></td></tr></table>	A	B	A <sub>1</sub>	B <sub>1</sub>	A <sub>2</sub>	B <sub>2</sub>	A <sub>3</sub>	B <sub>3</sub>	A <sub>4</sub>	B <sub>4</sub>
A	B										
A <sub>1</sub>	B <sub>1</sub>										
A <sub>2</sub>	B <sub>2</sub>										
A <sub>3</sub>	B <sub>3</sub>										
A <sub>4</sub>	B <sub>4</sub>										

$R_2$ :	<table border="1" style="display: inline-table;"><tr><th>X</th><th>Y</th></tr><tr><td>A<sub>1</sub></td><td>B<sub>1</sub></td></tr><tr><td>A<sub>7</sub></td><td>B<sub>7</sub></td></tr><tr><td>A<sub>2</sub></td><td>B<sub>2</sub></td></tr><tr><td>A<sub>4</sub></td><td>B<sub>4</sub></td></tr></table>	X	Y	A <sub>1</sub>	B <sub>1</sub>	A <sub>7</sub>	B <sub>7</sub>	A <sub>2</sub>	B <sub>2</sub>	A <sub>4</sub>	B <sub>4</sub>
X	Y										
A <sub>1</sub>	B <sub>1</sub>										
A <sub>7</sub>	B <sub>7</sub>										
A <sub>2</sub>	B <sub>2</sub>										
A <sub>4</sub>	B <sub>4</sub>										

$R_3$ :	<table border="1" style="display: inline-table;"><tr><td>A</td></tr><tr><td> </td></tr></table>	A	
A			

→ empty

- (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 ( $R_1 \div R_3$ )
- (d) Draw E.R Diagram for the statement given below. 6

**Note :** Use suitable notations at appropriate places.

“Many teachers teaches many students in many institutes affiliated to many Universities, the institutes are categorised as Engineering, Medical and Management institutes”.

3. (a) What do you mean by integrity constraints ? 4  
Briefly describe the various types of integrity constraints.
- (b) Explain insert, delete and update anomalies 6  
for a relation (R), with examples.
- (c) An ordered employee file (ordering field is 7  
emp\_id) has 20000 records, stored on a disk  
having block size 1k. Assume that each  
student record is of 100 bytes, the ordering  
field is of 8 bytes and block pointer is also of  
8 bytes, find how many block accesses on  
average may be saved on using primary  
index.
- (d) List the desirable properties of 3  
decomposition of a data base.
4. (a) Write SQL statements to perform following 8  
queries on the given relations i.e.  
Employee (Emp\_id, Emp\_name, Dept\_id)  
Department (Dept\_id, Dept\_name,  
Dept\_loc, Emp\_id)
- (i) List the names of employees whose  
name starts with 'S'
- (ii) To sort the employee data, in the  
alphabetic descending order.
- (iii) Find total number of employees.
- (iv) Find the department number and  
number of employees working in each  
department.

- (b) Explain 2 phase locking protocol. 4
  - (c) What is a transaction ? Briefly describe the properties of the transactions. 4
  - (d) Describe the following : 4
    - (i) Optimistic scheduling
    - (ii) Disadvantages of SQL
  
  - 5. (a) With the help of suitable example discuss the utility of check points in Database recovery. 6
  - (b) Explain the horizontal and vertical data fragmentation, with examples. 6
  - (c) Explain the following : 6
    - (i) Data Replication
    - (ii) 2-Tier Client/Server model
  - (d) List any four responsibilities of DBA. 2
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