University of Engineering & Management, Kolkata
Even Semester Term II Examination, May 2021

Course: B.Tech (CS) **Semester: 4th**

Paper Name: Database Management Systems
Paper Code: PCCCS403

Full Marks: 70 **Time: 2 Hours**

Attempt all questions. Each Question carries 10 marks.

1. A. Explain the three schema architecture of DBMS. Also define physical data independence and logical data independence. **[5+5]**

OR

B. What is a weak entity type? Explain with examples the concepts of primary key, candidate key and super key. **[5+5]**

2. A. What are the ACID properties of a transaction? Explain each of them in detail by considering an example of a transaction scenario. **[5+5]**

OR

B. Consider the relational schema $R(A, B, C, D, E, F, G, H, I, J)$ and
The set of functional dependencies:

$$F : AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ$$

Find out the highest normal form for the given relation.

[5+5]

3. A. Draw an Entity-relationship diagram for a banking management system. Choose appropriate entities and their attributes. Also make use of the relationship between entities. **[5+5]**

OR

B. For a relation R (ABCD), Find the canonical cover of the FD Set:

$$F\{A \rightarrow BC, AC \rightarrow D, D \rightarrow B, AB \rightarrow D\}$$ **[5+5]**

4. A. Consider a relation ***Teacher*** with the attributes *Teacher Name*, *Gender*, DOB, *Subject Handles*, *School Name*, and *School Location*. Assume that ***Teacher*** is in 1NF. Answer the following questions with valid explanations: **[5+5]**

a) If *Teacher_Name* is the key for ***Teacher***, is ***Teacher*** in 2NF?
b) If (*Teacher_Name, DOB*) combination is the key for ***Teacher***, all the other attributes depend on the whole key, and only other FD is
School_Name -> School_Location.
Is **Teacher** in 3NF? –JUSTIFY **[5+5]**

OR

B. Consider the following schema:
employee (person-name, street, city)
works (person-name, company-name, salary)
company (company-name, city)
manages (person-name, manager-name)

Solve the following using relational algebra query:
a) Find the name of all employees (i.e., person) who work for the City Bank Company.
b) Find the name, street and city of all employees who work for City Bank and earn more than 10,000.
c) Find the names of all employees who live in the same city and on the same street as do their managers.
d) Find the names of all employees in this database who do not work for First Bank Corporation.
e) Find the names of all employees in this database who live in the same city as the company for which they work. **[5*2]**

5. A. i. What is cascading roll back in transaction? Draw example to explain.
ii. Explain with example: Dirty Read Problem, Blind Write Problem & Phantom Read Problem by drawing proper schedule example**.** **[4 +(3*2)]**

OR

B. i. Let T_1 transfer \$50 from A to B, and T_2 transfer 10% of the balance from A to B. Create 3 schedules, where, in Schedule 1, T_1 is followed by T_2, in Schedule 2, T_2 is followed by T_1 and Schedule 3 is not a serial schedule., but an equivalent schedule of Schedule 1.
ii. Define dense indexing & sparse indexing. **[5+5]**

6. A. Consider the following relation:
$R(A, B, C, D, E)$ and $FD : A \rightarrow BC, B \rightarrow E, CE \rightarrow D.$
Find the no of candidate keys for R. **[5+5]**

OR

B. Test the serializability for the following schedule with explanation. (Use view serializability criterion):

T1	T2	T3	T4	T5
Read (y)	Read (x)			
Read (z)				
				Read (v)
				Read (w)
				Write (w)
	Read (y)			
	Write (y)			
		Write (z)		
Read (u)				
			Read (y)	
			Write (y)	
			Read (z)	
			Write (z)	
Read (u)				
Write (u)				

State the 3 rules tested for view serializability test with example. **[5+5]**

7. **A.** Draw the precedence graph for the following schedule. Test the schedule whether it is equivalent to a serial schedule not. If it has only non-conflicting instructions then write down the equivalent serial schedule :

T1	T2	T3
		R (y)
		R (z)
R (x)		
W (x)		
		W (y)
		W (y)
	R (z)	
R (y)		
W (y)		
	R (y)	
	W (y)	
	R (x)	
	W (x)	

[10]

OR

B. Consider the following two transactions :

```
T 1 :  read ( A ) ;
       read ( B ) ;
       if A = 0, then
       B : = B + 1 ;
       write ( B )
T 2 :  read ( B ) ;
       read ( A ) ;
       if B = 0, then
       A : = A +1 ;
       write ( A )
```

Add lock and unlock instructions to transactions T 1 and T 2 , so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock. **[5+5]**

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