Roll Number:_____

Thapar Institute of Engineering and Technology Patiala
Computer Science and Engineering Department
End Sem Test

BE Second Year (4th Semester) 13th May, 2023	UCS310: Database Management System
Time: 3 Hours, Max Marks:40	Coordinators: Dr Geeta Kasana, Dr. Ranjeet Kumar Ranjan

Instructors: Geeta Kasana, Ranjeet Kumar Ranjan, Deepak Kumar Dewangan, Sumit Sharma, Manisha Kaushal, Rakesh Kumar Yadav, Sanjeev Rao

Note: Attempt all parts of a question and answer them in order. A new question must start from new page. Assume any missing data.

Q1	a) Consider a relation R (A, B, C, D, E) with FDs: $$AB \rightarrow C,$$ $$AC \rightarrow B,$$ $$BC \rightarrow A, \text{ and}$$ $$D \rightarrow E.$$ i. Determine all the candidate keys of relation R. ii. Is relation R (A, B, C, D, E) in 2NF? If not, justify your answer and convert into 2NF. iii. Is relation R (A, B, C, D, E) in 3NF? If not, justify your answer and convert into 3NF. iv. Is relation R (A, B, C, D, E) in BCNF or not? Justify your answer b) Differentiate between lossy and lossless decomposition used in Normalization with a suitable example.	6+2
Q2	a) Consider the following four schedules using read and write operation on a data item X, denoted by r(x) and w(x) respectively. Find the following schedules are conflict serializable or not, with explanation. S1: $r_1(X)$; $r_2(X)$; $w_1(X)$; $r_3(X)$; $w_2(X)$ S2: $r_2(X)$; $r_1(X)$; $w_2(X)$; $r_3(X)$; $w_1(X)$; S3: $r_3(X)$; $r_2(X)$; $r_1(X)$; $w_2(X)$; $w_1(X)$; S4: $r_2(X)$; $w_2(X)$; $r_3(X)$; $r_1(X)$; $w_1(X)$; b) Consider the following schedule S of transactions T1, T2, T3, T4:	2+2+4

T1	T2	T3	T4
	Read(X)		
		Read(Z) Write(X) Commit	
Read(Z) Write(X) Commit			
	Write(Y) Read(Z) Commit		
			Read(X) Read(Y) Commit

Using precedence graph, describe whether the above Schedule is conflict serializable, view serializable or both.

c) Explain Cascadeless Recoverable schedule. Find out whether the given schedule S is Cascadeless schedule or not. Justify your answer.

S: $R_1(A)$ $R_2(C)$ $R_3(A)$ $R_1(C)$ $R_2(B)$ $R_3(B)$ $W_1(A)$ C_1 $W_2(C)$ $W_3(B)$ $W_2(B)$ C_3 C_2.

Where, $R_i(X)$ and $W_i(X)$ represent read and write operations on data item X by transaction T_i respectively and C_i is commit of transaction T_i.

| Q3 | a) | Explain Strict Two-Phase Locking (Strict 2PL) protocol and its advantages with respect to basic 2PL. For the given schedule below, explain whether Basic 2PL and Strict 2PL can be applicable or not. | 5+3 |

```
        T1        T2
     _____

     Read(A)
     Write(A)
     Read(B)
                Read(A)
                Read(C)
     Write(B)
```

b) Consider a database with objects X and Y and assume that there are two transactions $T1$ and $T2$. Transaction $T1$ reads objects X and Y and then writes object X. Transaction $T2$ reads objects X and Y and then writes objects X and Y. Using the given operations of transactions T1 and T2, construct the schedules which show the following conflicts. Also justify how conflicts occur.
(i)   write-read conflict
(ii)   read-write conflict
(iii) write-write conflict

| Q4 | a) | Consider the table **Emp** (empno, ename, deptno, salary) to write a PL/SQL program to increase the salary of an employee according to the following rule: | 6+2 |

- Salary of the department number 10 employees increased by 1000.
- Salary of the department number 20 employees increased by 500.
- Salary of the department number 30 employees increased by 500.
- Store the employee number, old salary and new salary in another table named temp having three columns empno, old_ salary, new_ salary.

b) Write the PL/SQL program to define and raise a user defined exception named *invalid_id.* for above table **Emp**, if [*empno* <= 0].

| Q5 | a) | Convert the following E-R diagram to Tables. Explicitly mention primary and foreign keys for each of the table. | 5+3 |

b) List any six responsibilities performed by Database Administrator (DBA).

****************ALL THE BEST****************