National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Advance Database Concepts**	**Course Code:**	**CS4064**
Program:	**BS(Computer Science)**	**Semester:**	**Spring 2023**
Out Date:	**11-Feb-2023**	**Total Marks:**	**100**
Due Date:	**Tue 21-Feb-2023** ***(Start of class)***	**Weight:**	
	~~**Thu 16-Feb-2023**~~	**Page(s):**	**1**
Assignment:	**1 (CCT)**		

Instructions:

- Use any valid assumption where needed.
- You are required to submit the hard copy of your assignment at the start of your class.
- For any query, please contact your TA.

Consider the following schedule of actions, listed in the order they are submitted to the DBMS:

Schedule S1: $r_1(X), r_2(Y), r_1(Z), r_2(X), w_2(X), r_2(Z), r_3(Y), w_2(Z), w_1(Y), w_3(Y), c_3, r_1(Y), w_2(Y), c_2, c_1$.

Schedule S2: $r_2(X), w_1(Y), w_2(Y), w_1(X), w_3(Z), c_1, w_2(X), c_2, w_3(X), c_3$.

For each of the following concurrency control mechanisms, describe how the concurrency control mechanism handles the schedule. Assume that the timestamp of transaction *Ti* is *i*. For lock-based concurrency control mechanisms, add lock and unlock requests to the above schedule of actions as per the locking protocol. The DBMS processes actions in the order shown. If a transaction is blocked, assume that all its actions are queued until it is resumed; the DBMS continues with the next action (according to the listed schedule) of an unblocked transaction.

Q1. Basic 2PL with protocol based on a timestamp for deadlock avoidance (use wait-die policy)

Q2. Strict 2PL with protocol based on a timestamp for deadlock avoidance (use wound-wait policy)

Q3. Rigorous 2PL with protocol based on a timestamp for deadlock avoidance (use wait-die policy)

Q4. Rigorous 2PL with protocol based on a timestamp for deadlock avoidance (use wound-wait policy)

Q5. Rigorous 2PL with protocol based on a deadlock detection (Use wait-for-graph to deal with deadlock)

Q6. Basic Timestamp Ordering (TO) protocol

Q7. Strict Timestamp Ordering protocol

Q8. Timestamp Ordering using Thomas's Write Rule (TWR)

Q9. Multi-version Timestamp Ordering protocol

Q10. Validation (Optimistic) Concurrency Control Technique (Use defer the validation until a later time when the conflicting transactions have finished)