Database System Implementation- CSE 507
Homework 4
Due date: April 11, 2016 9:00am

Instructions:

- All submissions must be made through usebackpack site for this course (https://www.usebackpack.com/iiitd/w2016/cse507)
- Only one submission per team would be considered and graded. It would be assumed that all members of the team have participated equally and same score would be given to all members of the team.
- Your submission should have names of all the members of your team.
- Any assumptions made while solving the problem should be clearly stated in the solution.
- Question 4 is for teams of size 3. These questions will not be graded for teams for size 2 or less.

Question 1   **(15 Points)**

Apply the basic version of the time stamp ordering Concurrency Control technique to the schedule in Table 1 and determine whether the algorithm will allow the execution of the schedule. Assume T1 arrives at T=3, T2 arrives at T=1 and T3 arrives at T=2. Which transactions are rolled back? And why? Explain in terms of conflicts and serializability goals of the time stamp ordering algorithm.
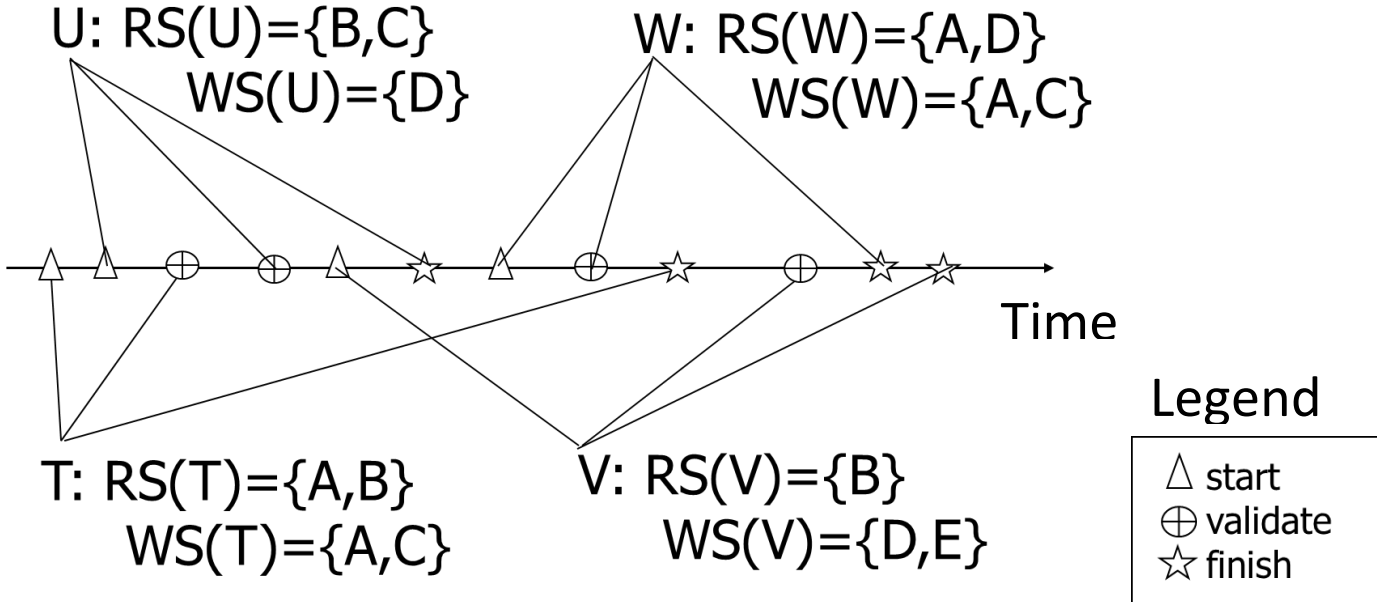
Table 1: Schedule for Question 1.

Transaction 1	Transaction 2	Transaction 3
	read_item(Z)	
	read_item(Y)	
	write_item(Y)	
		read_item(Y)
		read_item(Z)
Read_item(X)		
Write_item(X)		
		write_item(Y)
		write_item(Z)
	Read_item(X)	
Read_item(Y)		
Write_item(Y)		
	Write_item(X)	
	Read_item(Y)	

Time

Question 2 (20 Points)

Apply the validation based concurrency control technique on the following schedule containing transactions U, T, W and V. Which of these transactions pass the validation test and which are effectively rolled back? Your answer should contain detailed steps on how each transaction is validated. Please refer to my slides on this topic (slide 66 in w5p1.pptx).

U: RS(U)={B,C}
   WS(U)={D}

W: RS(W)={A,D}
   WS(W)={A,C}

T: RS(T)={A,B}
   WS(T)={A,C}

V: RS(V)={B}
   WS(V)={D,E}

Time

Legend

|	
△	start
⊕	validate
☆	finish

Question 3 (15 Points)

Table 2 shows the log corresponding to a particular schedule at the point of a system crash for the four transactions T1, T2, T3, and T4. Suppose that we use the immediate update protocol with check pointing. Describe the recovery process at the start after a system crash. Specify which transactions are rolled back, which operations in the log are redone and which (if any) are undone, and whether any cascading rollback takes place. Assume strict 2PL being followed at level of concurrency control technique.

Table 2: Log file retrieved for the Schedule for Question 5 and Question 6.

[Start_transaction, T1]
[read_item, T1, A]
[read_item, T1,D]
[write_item, T1, D, 20,25]
[Commit, T1]
[checkpoint]
[start_transaction, T2]
[read_item, T2, B]
[write_item, T2, B, 12, 18]
[start_transaction, T4]

[read_item, T4, D]
[write_item, T4, D, 25, 15]
[start_transaction, T3]
[write_item, T3, C, 30, 40]
[read_item, T4, A]
[write_item, T4, A, 30, 20]
[read_item,T2, B]
[write_item, T2, B, 15, 35]
[commit, T3]

← System Crash
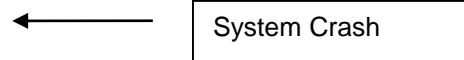
Question 4   (15 Points)

Consider the following GRANT statements being executed by the Database Administrator (DBA) and the group of users Peter, Jack, Ria and Allen.

(1) DBA grants insert, update, delete, and select privileges on Employee table to Jack with GRANT option.
(2) DBA grants select and insert privilege on Employee table to Allen.
(3) Jack grants insert and select privilege on Employee table to Ria with GRANT option.
(4) Ria grants insert privilege on Employee table to Allen with GRANT option.
(5) Allen grants insert privileges on Employee table to Peter with GRANT option.
(6) Peter grants insert privileges on Employee table to Ria

(a) Draw the authorization grant graph of this scenario.
(b) Which REVOKE statements are needed to remove insert privilege from Allen?
(c) The DBA executes revoke statement (with cascade) on the insert privileges of Jack. Write down the privileges held by Peter, Jack, Ria and Allen after this revoke statement.