COMP 3311: Database Management Systems

Lecture 22 Exercises
Concurrency Control: Timestamp-based Protocols

Exercise 1: Use the single version, timestamp-ordering protocol to complete the following non-serializable schedule assuming the timestamps 1, 2, and 3 for transactions T_1, T_2, and T_3, respectively. Show where the protocol will fail. Assume initial R/W timestamp of all items is 0.

T_1 [TS=1]	T_2 [TS=2]	T_3 [TS=3]
read(X)		
	read(Y)	
	write(Y)	
		write(Z)
write(X)		
	read(X)	
	write(X)	
		read(Y)
		write(Y)
write(Z)		

Exercise 2: Use the multi-version, timestamp-ordering protocol to complete the schedule of Exercise 1 assuming the timestamps 1, 2, and 3 for transactions T_1, T_2, and T_3, respectively. Assume initial R/W timestamp of all items is 0.

X	
$RTS(X_0) = 0$	$WTS(X_0) = 0$
$RTS(X_1) =$	$WTS(X_1) =$

Y	
$RTS(Y_0) = 0$	$WTS(Y_0) = 0$
$RTS(Y_1) =$	$WTS(Y_1) =$

Z	
$RTS(Z_0) = 0$	$WTS(Z_0) = 0$

T_1 [TS=1]	T_2 [TS=2]	T_3 [TS=3]
read(X)		
	read(Y)	
	write(Y)	
		write(Z)
write(X)		
	read(X)	
	write(X)	
		read(Y)
		write(Y)
write(Z)		

Name: _____/_____ **Student#:** _____ **Date:** _____
Family/Last (PRINT) Given/First (PRINT)

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Exercise 3: The following schedule is conflict serializable.

(a) What is the equivalent serial schedule? _____

(b) Assign appropriate timestamps to the transactions T_1, T_2, T_3 and T_4 so that the schedule is conflict serializable according to the single version, timestamp-based protocol. Assume initial R/W timestamp of all items is 0.

T_1 [TS=]	T_2 [TS=]	T_3 [TS=]	T_4 [TS=]
read(X)			
write(X)			
	read(X)		
		read(Y)	
		write(Y)	
	write(X)		
			read(Y)
write(Y)			

Exercise 4: Use the multi version, timestamp-ordering protocol to complete the conflict serializable schedule of Exercise 3 assuming the timestamps 1, 2, 3, and 4 for transactions T_1, T_2, T_3 and T_4, respectively. Show where the protocol will fail. Assume initial R/W timestamp of all items is 0.

X	
$RTS(X_0) = 0$	$WTS(X_0) = 0$
$RTS(X_1) =$	$WTS(X_1) =$
$RTS(X_2) =$	$WTS(X_2) =$

Y	
$RTS(Y_0) = 0$	$WTS(Y_0) = 0$
$RTS(Y_1) =$	$WTS(Y_1) =$
$RTS(Y_2) =$	$WTS(Y_2) =$

T_1 [TS=1]	T_2 [TS=2]	T_3 [TS=3]	T_4 [TS=4]
read(X)			
write(X)			
	read(X)		
		read(Y)	
		write(Y)	
	write(X)		
			read(Y)
write(Y)			

You must upload this completed exercise sheet to Canvas by **2:30 p.m. today.**