

Homework 1

Question 1:

For each of the following schedules:

- a) $S_a = r_1(A); w_1(B); r_2(B); w_2(C); r_3(C); w_3(A);$
- b) $S_b = r_1(A); r_2(A); r_1(B); r_2(B); r_3(A); r_4(B); w_1(A); w_2(B);$

Answer the following questions:

- i. What is the precedence graph for the schedule?
- ii. Is the schedule conflict-serializable? If so, what are all the equivalent serial schedules?

Question 2:

In the following sequences of events, we use $R_i(X)$ to mean “transaction T_i starts, and its read set is the list of the database elements X ”. Also, V_i means “ T_i attempts to validate”, and $W_i(X)$ means that “ T_i finishes, and its write set was X ”. State what happens when each sequence is processed by a validation-based scheduler. In particular, state which set intersections are performed for each V_j action and indicate if the validation is successful or not.

- a) $R_1(A,B); R_2(B,C); R_3(C); V_1; V_2; V_3; W_1(A); W_2(B); W_3(C);$
- b) $R_1(A,B); R_2(B,C); R_3(B); V_1; V_2; W_1(C); V_3; W_2(B); W_3(C);$

Question 3:

Give a schedule S as follow,

	T1	T2	T3	T4
1		Read(A)		
2			Read (A)	
3		Write(B)		
4			Write(A)	
5	Read(B)			
6				Read (B)
7	Read (A)			
8	Write(C)			
9				Write(A)

Using three timestamp techniques to control four transactions above concurrently with each of following timestamps:

- a) 300, 310, 320, 330
- b) 250, 200, 210, 275

Note: in multiversion timestamp technique, assume that the initial timestamps of A, B, C are zero.

Question 4:

Give a schedule S as follow,

	T1	T2	T3	T4
1	RL(A)			
2			RL(B)	
3	RL(C)			
4	UL(C)			
5		WL(C)		
6		UL(C)		
7				WL(C)
8	UL(A)			
9				WL(A)
10				UL(A)
11			WL(A)	
12			UL(B)	
13		RL(B)		
14		UL(B)		
15			WL(B)	
16			UL(A)	
17			UL(B)	
18				UL(C)

- Is the schedule S conflict serializable? Support your answer.
- Do we have any upgrading clocks in this schedule S? If any, using the three-lock mode technique to control simultaneously four transactions of S.

Question 5:

Give a schedule S as follow,

	T1	T2	T3	T4	T5
1	RL(A)				
2	UL(A)				
3			WL(A)		
4		RL(B)			
5			UL(A)		
6				RL(A)	
7		UL(B)			
8					WL(B)
9				UL(A)	
10		WL(A)			
11	WL(C)				
12	UL(C)				
13		RL(C)			
14			RL(C)		

15					UL(B)
16				WL(B)	
17		UL(C)			
18			UL(C)		
19		UL(A)			
20				UL(B)	
21					WL(C)
22					UL(C)

Is schedule S serializable under tree protocol or not? Support your answer.

Question 6:

Consider the objects of class C are stored on two blocks, B1 and B2. Block B1 contains objects O1 and O2, while block B2 contains objects O3, O4, and O5. The entire set of objects of class C, the blocks, and the individual objects form a hierarchy of lockable database elements. Tell the sequence of lock requests and the response of a warning-protocol-based scheduler to the following sequences of requests. You may assume all requests occur just before they are needed, and all unlocks occur at the end of the transaction.

- a) r1(O1); w2(O2); r2(O3); w1(O4);
- b) r1(O5); w2(O5); r2(O3); w1(O4);
- c) r1(O1); r1(O3); r2(O1); w2(O4); w2 (O5);
- d) r1(O1); r2(O2); r3(O1); w1(O3); w2(O4); w3(O5); w1(O2);

The end.