

Quiz Sheet No. 3 for *Architecture and Implementation of Database Systems*
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Exercises for Chapters 4.2 – 4.7: Serializability and Synchronization


1. Let $H: r_1(y), r_3(n), r_2(y), w_1(y), r_1(x), w_1(x), r_2(x), r_2(z), w_2(z), r_3(x), w_3(x)$ be a schedule of three transactions t_1, t_2 and t_3 that are accessing objects n, x, y and z .
 - a) Write the sequence of actions for each transaction t_1, t_2 and t_3 .
 - b) Determine the conflict relation conf_H .
 - c) Sketch the corresponding conflict graph using the “follow relation” (defined in chapter 4.3 on page 11).
 - d) Is schedule H conflict serializable?

2. Let t_1, t_2 and t_3 be three transactions that are defined in the following way:

$t_1 = (\text{bot}, r(u), r(y), w(y), r(z), w(z), w(u), \text{eot})$
 $t_2 = (\text{bot}, r(z), r(u), r(y), w(z), \text{eot})$
 $t_3 = (\text{bot}, r(z), r(y), r(u), w(u), \text{eot})$

 - a) Compute $\overline{\text{conf}}$ for the set of operations in t_1, t_2 and t_3 .
 - b) Consider the following schedule $H1$:

t_1	t_2	t_3
$r(u)$		
$r(y)$		
	$r(z)$	
	$r(u)$	
$w(y)$		
		$r(z)$
		$r(y)$
	$r(y)$	
$r(z)$		
$w(z)$		
		$r(u)$
		$w(u)$
$w(u)$		
	$w(z)$	



timeline

Determine the relation conf_{H1} for schedule $H1$.

c) Consider a second schedule H2:

t₁	t₂	t₃
r(u)		
	r(z)	
r(y)		
	r(u)	
	r(y)	
w(y)		
	w(z)	
r(z)		
w(z)		
		r(z)
		r(y)
w(u)		
		r(u)
		w(u)

Show that H2 is conflict serializable.

- d) Describe some possibilities for modifying H2 to a new schedule H3, so that H3 is also serializable.
- e) List the lock requests for each transaction t_1 , t_2 and t_3 according to the (R,A,X) protocol.

3. Assume optimistic concurrency control (OCC) regarding this schedule:

t₁	t₂
bot	
	bot
r(x)	
r(y)	
	r(z)
w(x)	
	w(z)
eot	
	r(x)
	eot

- a) Determine the ReadSet and WriteSet of each transaction.
- b) What will happen to transaction t_2 in this execution order? Why?