COMP 3311: Database Management Systems

Lecture 19 Exercises
Transactions

Exercise 1: Indicate which of the following schedules involving T_1 and T_2 is serial, serializable or not serializable. r_i denotes a read (of Transaction T_i) and w_i is a write (of Transaction T_i).

a) $r_1(A)\ w_1(A)\ r_2(A)\ w_2(A)$

T_1	T_2
read(A)	
write(A)	
	read(A)
	write(A)

b) $r_1(A)\ r_2(A)\ w_1(A)\ w_2(B)$

T_1	T_2
read(A)	
	read(A)
write(A)	
	write(B)

c) $r_1(A)\ r_2(A)\ w_1(A)\ w_2(A)$

T_1	T_2
read(A)	
	read(A)
write(A)	
	write(A)

d) $r_2(A)\ r_1(A)\ w_2(B)\ w_1(A)$

T_1	T_2
	read(A)
read(A)	
	write(B)
write(A)	

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Exercise 2: For each of the following schedules, state whether it is serializable, recoverable and cascadeless. Justify your answers. r_i denotes a read (of transaction T_i) and w_i a write (of transaction T_i).

a) $w_1(X) \ r_2(X) \ w_1(X) \ c_2 \ a_1$

   Serializable: ☐ Yes   ☐ No
   Justification:

   Recoverable: ☐ Yes   ☐ No
   Justification:

   Cascadeless: ☐ Yes   ☐ No
   Justification:

b) $r_2(X) \ w_3(X) \ c_3 \ w_1(Y) \ c_1 \ r_2(Y) \ w_2(Z) \ c_2$

   Serializable: ☐ Yes   ☐ No
   Justification:

   Recoverable: ☐ Yes   ☐ No
   Justification:

   Cascadeless: ☐ Yes   ☐ No
   Justification:

c) $r_1(X) \ w_2(X) \ c_2 \ w_1(X) \ c_1 \ r_3(X) \ c_3$

   Serializable: ☐ Yes   ☐ No
   Justification:

   Recoverable: ☐ Yes   ☐ No
   Justification:

   Cascadeless: ☐ Yes   ☐ No
   Justification:

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Exercise 3: For each of the following schedules, answer the questions.

a)

T_1	T_2	T_3
read(X)		
	read(Y)	
	write(Y)	
		write(Z)
write(X)		
	read(X)	
	write(X)	
		read(Y)
		write(Y)
write(Z)		

Serializable: ☐ Yes ☐ No   Justification?

If there is an equivalent serial schedule, give it below.

b)

T_1	T_2
	write(B)
read(A)	
write(A)	
	read(A)
commit	
	commit

Serializable: ☐ Yes ☐ No   Justification?

Recoverable: ☐ Yes ☐ No   Justification?

Cascadeless: ☐ Yes ☐ No   Justification?

c)

T_1	T_2
	read(A)
read(A)	
write(A)	
	write(B)
	commit
commit	

Recoverable: ☐ Yes ☐ No   Justification?

Cascadeless: ☐ Yes ☐ No   Justification?

You must upload this completed exercise sheet to Canvas by **11 p.m. today.**

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Exercise 4: Consider the following schedule consisting of three transactions T_1, T_2, and T_3. r_i denotes a read (of Transaction T_i) and w_i a write (of Transaction T_i).

<u>Schedule</u>: $r_3(Z)$ $w_3(Z)$ $r_1(X)$ $r_2(Y)$ $w_2(Y)$ $w_1(X)$ $r_1(Y)$ $r_3(X)$

a) Show that the schedule is serializable by <u>constructing the precedence graph</u>.

b) What is the equivalent serial schedule?

c) Modify the original schedule so it becomes <u>recoverable, but not cascadeless</u>, by adding commit operations to the <u>end</u> of the schedule.

<u>Schedule</u>:

$r_3(Z)$ $w_3(Z)$ $r_1(X)$ $r_2(Y)$ $w_2(Y)$ $w_1(X)$ $r_1(Y)$ $r_3(X)$

d) Modify the original schedule so it becomes <u>both recoverable and cascadeless</u> by adding commit operations <u>in the appropriate locations</u> in the schedule.

<u>Schedule</u>:

$r_3(Z)$ $w_3(Z)$ $r_1(X)$ $r_2(Y)$ $w_2(Y)$ $w_1(X)$ $r_1(Y)$ $r_3(X)$

You must upload this completed exercise sheet to Canvas by **11 p.m. today.**