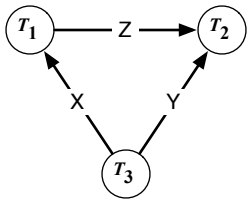
Chapter 21 – Transaction Processing Examples

UTD CS-6360 Dr. Chris Irwin Davis

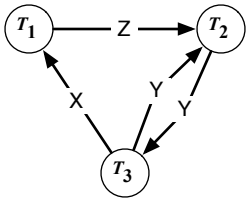
Exercise 21.23 - Consider the three transactions T_1, T_2, and T_3, and the schedules S_1 and S_2 given below. Draw the serializibility (precedence) graphs for S_1 and S_2 and state whether each schedule is serializable or not. If a schedule is serializable, write down *all* of the equivalent serial schedule(s). If a schedule is not serializable, write down *all* cycles.

T_1: $r_1(X)$; $r_1(Z)$; $w_1(X)$
T_2: $r_2(Z)$; $r_2(Y)$; $w_2(Z)$; $w_2(Y)$
T_3: $r_3(X)$; $r_3(Y)$; $w_3(Y)$
S_1: $r_1(X)$; $r_2(Z)$; $r_1(Z)$; $r_3(X)$; $r_3(Y)$; $w_1(X)$; $w_3(Y)$; $r_2(Y)$; $w_2(Z)$; $w_2(Y)$
S_2: $r_1(X)$; $r_2(Z)$; $r_3(X)$; $r_1(Z)$; $r_2(Y)$; $r_3(Y)$; $w_1(X)$; $w_2(Z)$; $w_3(Y)$; $w_2(Y)$



S_1 Serializable:

$T_3 \rightarrow T_1 \rightarrow T_2$



S_2 Non-Serializable:

Cycle: $Z(T_1 \rightarrow T_2)$; $Y(T_2 \rightarrow T_3)$; $X(T_3 \rightarrow T_1)$
Cycle: $Y(T_2 \rightarrow T_3)$; $Y(T_3 \rightarrow T_2)$

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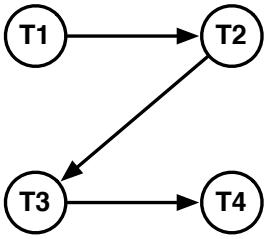
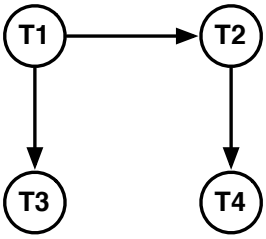
Here are some precedence graphs that have already been drawn. They are simplified in that they do not indicate the database item in conflict for each edge. If a schedule is serializable, write down *all* of the equivalent serial schedule(s). If a schedule is not serializable, write down *all* cycles.

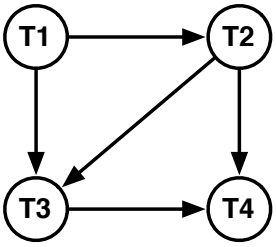
(a)



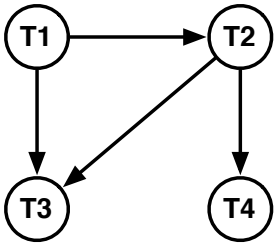
(b)



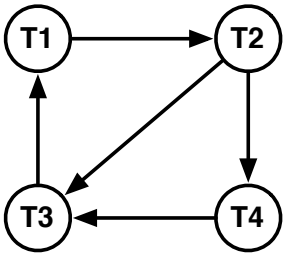
(c)



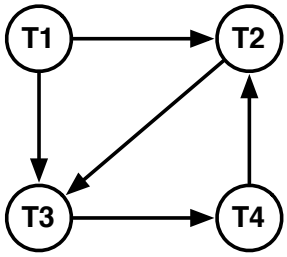
(d)



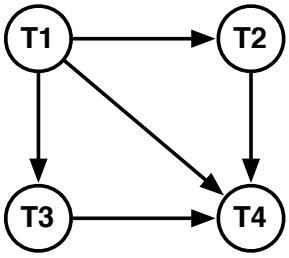
(e)



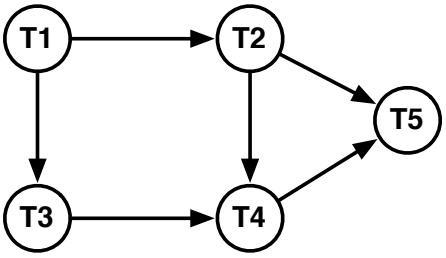
(f)



(g)



(h)



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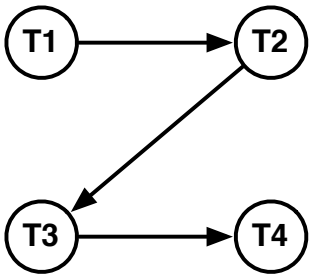
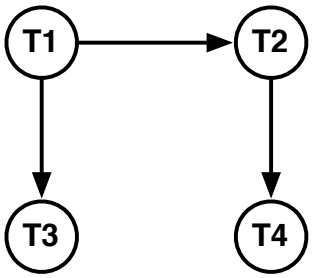
Answers:

(a)



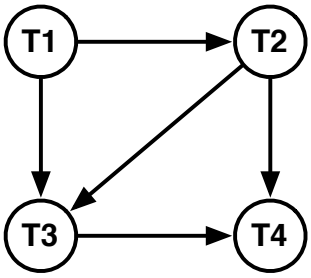
T1 ⟶ T2 ⟶ T3 ⟶ T4

(b)



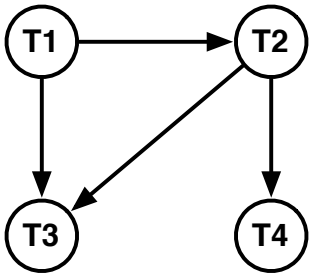
T1 ⟶ T3 ⟶ T2 ⟶ T4
T1 ⟶ T2 ⟶ T3 ⟶ T4
T1 ⟶ T2 ⟶ T4 ⟶ T3

(c)



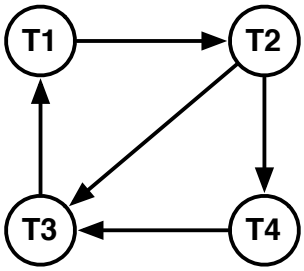
T1 ⟶ T2 ⟶ T3 ⟶ T4

(d)



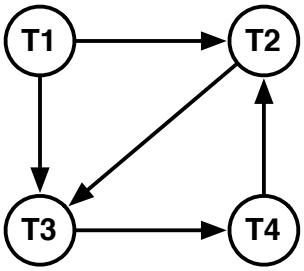
T1 ⟶ T2 ⟶ T3 ⟶ T4
T1 ⟶ T2 ⟶ T4 ⟶ T3

(e)



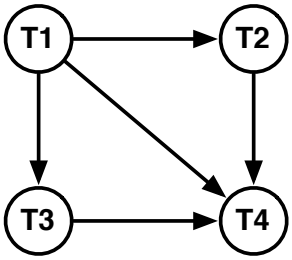
Cycle: (T1→T2), (T2→T3), (T3→T1)

(f)



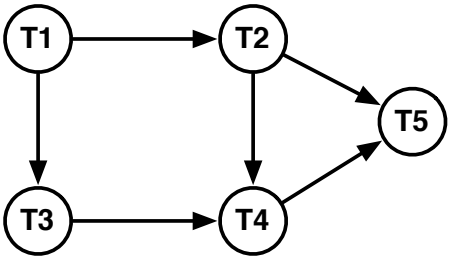
Cycle: (T2→T3), (T3→T4), (T4→T2)

(g)



T1 ⟶ T2 ⟶ T3 ⟶ T4
T1 ⟶ T3 ⟶ T2 ⟶ T4

(h)



T1 ⟶ T3 ⟶ T2 ⟶ T4 ⟶ T5
T1 ⟶ T2 ⟶ T3 ⟶ T4 ⟶ T5