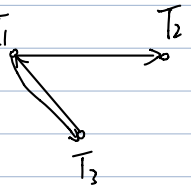
1.1. elim $\pi_{\#8}((\text{wrote-publication}) \times \sigma_{\#1=\#1}((\sigma_{\#3=2019}(\text{book})) \times \sigma_{\#1=\#3}(\text{author-aid}))$

1.2. elim $\pi_{\#4}(\pi_{\#1}(\sigma_{\#2='ACM\ TODS'}(\text{publication})) \times \sigma_{\#1=\#1}(\sigma_{\#3=1,\#4=1}(\text{journal-pubid})) \times \sigma_{\#1=\#1}(\text{article-appers-in}))$

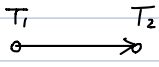
2. $S_1$:




$T_1 = \{r_1[x], r_1[z], w_1[z]\}$
$T_2 = \{r_2[y], w_2[x]\}$
$T_3 = \{r_3[z], w_3[z]\}$

since it is not acyclic, by theorem, S is not conflict serializable

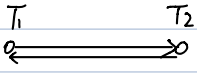
$S_2$:




$T_1 = \{w_1[x], w_1[y], w_1[z]\}$
$T_2 = \{r_2[x], w_2[x], r_2[y], w_2[y]\}$

since it is acyclic, by theorem, S is conflict serializable
Serial order is $\{T_1, T_2\}$

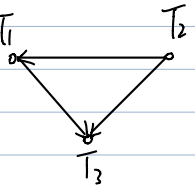
$S_3$:




$T_1 = \{w_1[x], w_1[y], w_1[z], w_1[u]\}$
$T_2 = \{r_2[u], w_2[x], r_2[y]\}$

since it is not acyclic, by theorem, S isn't conflict serializable

$S_4$:




$T_1 = \{w_1[x], w_1[y], w_1[z]\}$
$T_2 = \{w_2[u], w_2[y]\}$
$T_3 = \{w_3[x], w_3[u]\}$

since it is acyclic, by theorem, S is conflict serializable
Serial order is $\{T_2, T_1, T_3\}$

3. $w_3[x]$, $w_5[z]$ are blocked no deadlock

$r_1[x], r_2[x], r_2[y], r_1[y], r_1[z], c_1, w_3[x], w_4[z], c_2, a_4, w_5[z], c_5$

4. $T_1, T_3, T_5$ comitted
$T_4, T_2, T_6$ aborted

1. Scanning from tail to head, for each undo, x, v, write v to x.
2. Scanning from head to tail, for each redo, x, v in committed transactions, write v to x.

a=2
x=400
a=0
a=0
z=0
x=10
y=10
x=0
x=10

$x = 400$

$z = 100$

$\alpha = 2$