

Exercise 10

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1 ARIES I

A database system is in the middle of the **undo phase of ARIES**. The **write ahead log** currently contains the following entries (it was written up to LSN 20 before the crash occurred).

LSN	Type	TX	Prev	Page	UNxt	Redo	Undo
12	UPD	T_2	8	42	—	...	...
13	UPD	T_1	7	3	—	...	...
14	UPD	T_2	12	17	—	...	...
15	UPD	T_3	4	12	—	...	...
16	CLR	T_2	14	17	12	...	...
17	UPD	T_1	13	9	—	...	...
18	EOT	T_3	15	—	—	...	...
19	UPD	T_2	16	9	—	...	...
crash ⚡ → 20	UPD	T_1	17	4	—	...	...
21	CLR	T_1	20	4	17	...	...

1. Specify the next four log entries the system is going to write.

LSN	Type	TX	Prev	Page	UNxt	Redo	Undo

2. Which of the following statements are right/wrong?

right **wrong**

- Every data page modified until the last write operation of T have to be forced to disk by the time T commits.
- Every **log entry** until the last entry of T have to be forced to disk by the time T commits.
- Data pages modified by T must not be written back to disk before T commits.
- No **log entry** of T may be written to disk before T commits.

2 ARIES II

After a crash the **recovery** procedure finds the following log file:

LSN	Type	TX	Prev	Page	UNxt	Redo	Undo
0	UPD	T_1		1			
10	UPD	T_2		4			
20	EOT	T_1		—	—		
30	BCK						
40	UPD	T_2		3			
50	UPD	T_2		6			
60	UPD	T_4		2			
70	EOT	T_2		—	—		
80	UPD	T_3		1			
90	ECK						
100	UPD	T_3		5			
110	BCK						
120	UPD	T_4		1			
130	UPD	T_4		7			

We assume that the system started in a consistent state immediately before LSN 0 (or e.g. a *heavyweight checkpoint* was created right before LSN 0). On the hard disk page 1 comprises the LSN 80, page 3 the LSN 40; and all other pages have a LSN smaller than 0.

1. Which dirty page table will have been stored with the ECK (LSN 90) entry?
2. The **analyze pass** will start at which log entry?
3. During the analyze pass (in main memory) there will be **transaction control blocks** created again. Which information will be collected in this example?
4. At which log entry will the **redo phase** start?
5. Show in detail which actions and decisions the recovery process executes/makes during the **redo**.
6. Show the actions/decisions during the **undo phase**.
7. How does the log file look like after the recovery finished?