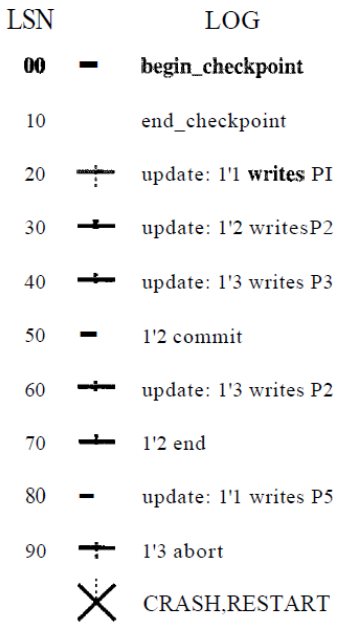
Exercise 18.5 – Question

Exercise 18.5 Consider the example execution shown in Figure 18.3. In addition, the system crashes during recovery after writing two log records to stable storage, and again after writing another two log records.

1. What is the value of the LSN stored in the master log record?
2. What is done during Analysis?
3. What is done during Redo?
4. What is done during Undo?
5. Show the log when recovery is complete, including all non-null prevLSN and undonextLSN values in log records.



Solution

Answer 18.5 1. LSN 00 is stored in the master log record as it is the LSN of the begin_checkpoint record.

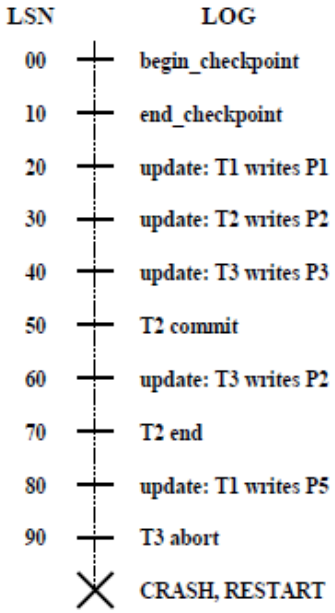


Figure 18.3 Execution With Multiple Crashes

2.
LSN 20 Add (T1,20) to TT and (P1,20) to DPT
LSN 30 Add (T2,30) to TT and (P2,30) to DPT
LSN 40 Add (T3,40) to TT and (P3,40) to DPT
LSN 50 Change status of T2 to C
LSN 60 Change (T3,40) to (T3,60)
LSN 70 Remove T2 from TT
LSN 80 Change (T1,20) to (T1,70) and add (P5,70) to DPT
LSN 90 No action

At the end of analysis, the transaction table has:
(T1,80), (T3,60).

The Dirty Page Table has:
(P1,20), (P2,30), (P3,40), (P5,80).

3. Redo starts from LSN 20 (minimum recLSN in DPT).

LSN 20 Check whether P1 has pageLSN more than 10 or not. Since it is a committed transaction, we probably need not redo this update.
LSN 30 Redo the change in P2
LSN 40 Redo the change in P3
LSN 50 No action
LSN 60 Redo the changes on P2
LSN 70 No action
LSN 80 Redo the changes on P5
LSN 90 No action

4. ToUndo consists of (80, 60).

LSN 80 Undo the changes in P5. Append a CLR: Undo T1 LSN 80, set undonextLSN = 20. Add 20 to ToUndo.

ToUndo consists of (60, 20).
LSN 60 Undo the changes on P2. Append a CLR: Undo T3 LSN 60, set undonextLSN = 40. Add 40 to ToUndo.

ToUndo consists of (40, 20).
LSN 40 Undo the changes on P3. Append a CLR: Undo T3 LSN 40, T3 end

ToUndo consists of (20).
LSN 20: Undo the changes on P1. Append a CLR: Undo T1 LSN 20, T1 end

5. The log looks like the following after recovery:

LSN 00	begin_checkpoint	
LSN 10	end_checkpoint	
LSN 20	update: T1 writes P1	
LSN 30	update: T2 writes P2	
LSN 40	update: T3 writes P3	
LSN 50	T2 commit	prevLSN = 30
LSN 60	update: T3 writes P2	prevLSN = 40
LSN 70	T2 end	prevLSN = 50
LSN 80	update: T1 writes P5	prevLSN = 20
LSN 90	T3 abort	prevLSN = 60
LSN 100	CLR: Undo T1 LSN 80	undonextLSN= 20
LSN 110	CLR: Undo T3 LSN 60	undonextLSN= 40
LSN 120,125	CLR: Undo T3 LSN 40	T3 end.
LSN 130,135	CLR: Undo T1 LSN 20	T1 end.