CSE 444 – Homework 5
Transactions Recovery

Name: _____

Question	Points	Score
1	15	
2	15	
3	30	
Total:	60	

1 Undo Log

1. (15 points)

   After a system's crash, the undo-log using non-quiescent checkpointing contains the following data:

```
< START T1 >
< T1, X1, 1 >
< START CKPT ???? >
< START T2 >
< T2, X2, 2 >
< T1, X1, 3 >
< START T3 >
< COMMIT T1 >
< END CKPT >
< START CKPT ???? >
< T2, X2, 4 >
< T3, X3, 5 >
< START T4 >
< COMMIT T2 >
< T4, X4, 6 >
< COMMIT T3 >
< END CKPT >
< START T5 >
< T5, X5, 7 >
< START CKPT ???? >
< T4, X4, 8 >
CRASH !!!
```

(a) (5 points) What are the correct values of the three <START CKPT ????> records? You have to provide three correct values for the three ????s.

First START CKPT: _____

Second START CKPT: _____

Third START CKPT: _____

(b) (5 points) Assuming that the three <START CKPT ???> records are correctly stored in the log, according to your answer in a., show which elements are recovered by the undo recovery manager and compute their values after recovery.

(c) (5 points) Indicate what fragment of the log the recovery manager needs to read.

2 Redo Log

2. (15 points)

After a system crash, the **redo-log** using non-quiescent checkpointing contains the following data:

```
< START T1 >
< START T2 >
< T1, A, 15 >
< START T3 >
< T2, B, 10 >
< T3, C, 20 >
< COMMIT T2 >
< COMMIT T3 >
< START CKPT ???? >
< START T4 >
< T1, D, 5 >
< COMMIT T1 >
< T4, E, 10 >
< END CKPT >
< COMMIT T4 >
< START T5 >
< T5, F, 10 >
< START CKPT ???? >
```

(a) (5 points) What are the correct values of the two <START CKPT ????> records? You have to provide two correct values for the two ????s.

First START CKPT: _____

Second START CKPT: _____

(b) (5 points) Indicate what fragment of the log the recovery manager needs to read.

(c) (5 points) Assuming that the two < START CKPT ??? > records are correctly stored in the log, according to your answer above, show which elements are recovered by the redo recovery manager and compute their values after recovery.

3 Aries

3. (30 points)

   A database contains two pages P1 and P2. P1 contains two elements A and B. P2 contains two elements C and D.

   Consider the following sequence of operations on the database:

   1. Transaction T1 writes A.
   2. The system flushes the log to disk and also flushes page P1 back to disk.
   3. Transaction T2 write B.
   4. Transaction T2 writes C.
   5. Transaction T2 aborts.
   6. The system performs all operations associated with rolling back T2. It writes an END log record for T2.
   7. Transaction T3 writes D.
   8. Transaction T1 commits.
   9. The system performs all operations associated with committing the transactions including writing an END log record. The whole log is flushed to disk.
   10. The system crashes.

(a) (10 points) Show the content of the write-ahead log, the transaction table, and the dirty page table right before the crash. Also show which pages are in memory and what is there content.

(b) (5 points) Show the content of the transaction table and the dirty page table right after the analysis phase completes.

(c) (5 points) Indicate which changes are redone during the REDO phase.

(d) (10 points) Show the content of the log and the state of the pages in memory at the end of the UNDO phase.