Solution

1. 
   a) No. Uncommitted data is never written to disk.
   b) Yes. Some committed data might have not been written to disk yet.
   c) Yes. Some uncommitted might have been written to disk.
   d) Yes. We need to repeat history, including looser transactions, before starting the UNDO phase.
   e) Begin_checkpoint of the most recent checkpoint
   f) Smallest recLSN in dirty page table at the end of Analysis
   g) Oldest log record of transactions active at crash

2. 
   a) Analysis determines that the last begin_checkpoint was at LSN 00 and starts at the corresponding 
      end_checkpoint (LSN 10). Transaction Table records are denoted as (transID, lastLSN, status) and 
      Dirty Page Table records are denoted as (pageID, recLSN) sets.
      Analysis phase runs till LSN 70 and does the following:
      
      LSN 20  Adds (T1, 20, U) to TT and (P5, 20) to DPT
      LSN 30  Adds (T2, 30, U) to TT and (P3,30) to DPT
      LSN 40  Changes (T2, 30, U) to (T2, 40, C)
      LSN 50  Deletes entry for T2 from Transaction Table
      LSN 60  Adds (T3, 60, U) to TT. Does not change P3 entry in DPT
      LSN 70  Adds (P2, 70) to DPT
              and Changes (T1, 20, U) to (T1, 70, U)
      LSN 80  Changes (T1, 70, U) to (T1, 80, U)

      The final Transaction Table has two entries: (T1, 80, U), and (T3, 60, U).
      The final Dirty Page Table has three entries (P5,20), (P3,30), and (P2, 70).
   b) 
      LSN 20  P5 is retrieved and its pageLSN is checked. If the page had
              been written to disk before the crash (i.e. if pageLSN >= 20),
              nothing is redone otherwise the changes are redone.
      LSN 30  P3 is retrieved and its pageLSN is checked. If the page had
              been written to disk before the crash (i.e. if pageLSN >= 30),
              nothing is redone otherwise the changes are redone.
      LSN 40  No action
      LSN 50  No action
      LSN 60  P3 is retrieved and its pageLSN is checked. If the page had
              been written to disk before the crash (i.e. if pageLSN >= 60),
              nothing is redone otherwise the changes are redone.
      LSN 70  P2 is retrieved and its pageLSN is checked. If the page had
              been written to disk before the crash (i.e. if pageLSN >= 70),
              nothing is redone otherwise the changes are redone.
      LSN 80  No action
c) UNDO phase starts at LSN 80 (highest lastLSN in TT). The Loser Set consists of LSNs 80 and 60.

| LSN 80  | Removes 80 from the Loser Set. Adds LSN 70 to the Loser Set. Loser Set = (70, 60). |
| LSN 70  | Removes 70 from the Loser Set. Undoes the change on P2 and adds a CLR indicating this Undo (LSN 90, undoNextLSN = 20). Loser Set = (60, 20). |
| LSN 60  | Undoes the change on P3 and adds a CLR indicating this Undo (LSN 100, undoNextLSN = null). Loser Set = (20). |
| LSN 20  | Undoes the change on P5 and adds a CLR indicating this Undo (LSN 110, undoNextLSN = null). |