1. Consider the given execution

a) What is done during Analysis?

The Analysis phase starts with the most recent begin checkpoint record and proceeds forward in the log until the last log record. It determines
(a) The point in the log at which to start the Redo pass
(b) The dirty pages in the buffer pool at the time of the crash.
(c) Transactions that were active at the time of the crash which need to be undone.

before checkpoint:
Add(T1,10, ) to TT
Add(T2,20) to TT
remove T2 from TT
Add(T3,40) to TT
take checkpoint
Analysis starts here:
update (T1,60) in TT
update (T3,70) in TT
b) What is done during Redo?
The Redo phase follows Analysis and redoes all changes to any page that might have been dirty at the time of the crash.
In our example no flush is executed so, redo everything starting from LSN 10 which is the smallest LSN in DPT.

c) What is done during Undo?
The Undo phase follows Redo and undoes the changes of all transactions that were active at the time of the crash.
In our example Undo(T3,70) -> Undo(T3,40)
     Undo(T1,60) -> Undo(T1,10)

2. Briefly describe
a. WAL protocol
WAL Protocol: Whenever a change is made to a database object, the change is first recorded in the log and the log is written to stable storage before the change is written to disk.

b. The steal and no-force policies
If a steal policy is in effect, the changes made to an object in the buffer pool (cache) by a transaction can be written to disk before the transaction commits. This might be because some other transaction might “steal” the buffer page presently occupied by an uncommitted transaction.
A no-force policy is in effect if, when a transaction commits, we need not ensure that all the changes it has made to objects in the buffer pool are immediately forced to disk.