Consider a relation T(L, M, N, O, P) with FDs

- LM→OPN
- PM→N
- O→P
- LP→N
- MNOP→L

Using the method covered in class, find a minimal cover for this relation. Write your answer here:

Closures (just for interest's sake, but it can be helpful to see what is going on)

LM^+ = {L, M, O, P, N}

PM^+ = {P, M, N}

O^+ = {O, P}

LP^+ = {L, P, N}

MNO^+ = {M, N, O, L, P}

Minimal Cover

1. Put FDs in standard form:
   LM→O
   LM→P
   LM→N
   PM→N
   O→P
   LP→N
   MNOP→L

2. Minimize LHS of each FD
   Nothing to do for most of these. However, O→P means that the P in MNOP is redundant so you can make that one MNO→L.

   Additionally, the closure of MO includes N, so that can also be removed, the current list is now:
   LM→O
   LM→P
   LM→N
   PM→N
   O→P
   LP→N
   MO→L

3. Delete redundant FDs

   Taking the closure of LM without using LM→P yields: $LM^+ = \{L, M, O, P, N\}$, so LM→P is redundant. At this point, we have:

   LM→O
   LM→N
   PM→N
   O→P
   LP→N
   MO→L

   Similarly, taking the closure of LM without using LM→N yields $LM^+= \{L, M, O, P, N\}$ (derived by LM -> O, O -> P, PM -> N), so the final answer is:

   LM→O
   PM→N
   O→P
   LP→N
   MO→L