Problem 3. We are given that

$$E_t\{F\tilde{X}_{t+1} + G\tilde{X}_t + H\tilde{X}_{t-1} + L\tilde{Z}_{t+1} + M\tilde{Z}_t\} = 0$$

$$\tilde{Z}_t = N\tilde{Z}_{t-1} + \epsilon_t$$
$$\tilde{X}_t = P\tilde{X}_{t-1} + Q\tilde{Z}_t$$

We express each term in the first equation as a function of the second and third and simply the resulting expression. Since the $E_t(\epsilon) = 0$, and all other terms are deterministic, the expectation can also be removed.

$$\begin{aligned}
0 &= E_t\{F\tilde{X}_{t+1} + G\tilde{X}_t + H\tilde{X}_{t-1} + L\tilde{Z}_{t+1} + M\tilde{Z}_t\} \\
&= F(P^2\tilde{X}_{t-1} + PQ\tilde{Z}_t + Q\tilde{Z}_{t+1}) + G(P\tilde{X}_{t-1} + Q\tilde{Z}_t) + H\tilde{X}_{t-1} + LN\tilde{Z}_t + M\tilde{Z}_t \\
&= (FP^2 + GP + H)\tilde{X}_{t-1} + (FPQ + GQ + LN + M)\tilde{Z}_t + FQ\tilde{Z}_{t+1} \\
&= (FP^2 + GP + H)\tilde{X}_{t-1} + (FPQ + GQ + LN + M + FQN)\tilde{Z}_t \\
&= ((FP + G)P + H)\tilde{X}_{t-1} + ((FQ + L)N + (FP + G)Q + M)\tilde{Z}_t
\end{aligned}$$

Problem 1 - 2, 4 - 11. Refer to my Linearization python notebook.