Problem 1. Compute the elements of the third row of $Y_{bus}$ for the power system in Example 6.9 of textbook.

Problem 2. Given the impedance diagram of a simple system as shown in Figure 1, draw the admittance diagram for the system and develop the 4 x 4 bus admittance matrix $Y_{bus}$ by inspection.

![Figure 1: System diagram for problem 2.](image)

Problem 3. A load $L$ consuming 1 p.u. of active power and 0.5 p.u. of reactive power is connected to a generator $G1$ through a short transmission line with $Z' = 0.02 + j0.06$ p.u. Also, there is a capacitor connected to the load bus with admittance $Y_{cap} = j0.25$ p.u. The generator voltage is voltage $V_{G1} = 1\angle0$.

a) Draw the one line diagram of this system indicating clearly all the elements referenced above.

b) Write the admittance matrix $Y_{bus}$ for this system.

c) Write the power flow equations for this system. **DO NOT SOLVE!**

Problem 4. Use PowerWorld Simulator to modify the Example 6.9 in textbook by inserting a second line between bus 2 and bus 5. Give the new line a circuit identifier of $\tilde{2}$ to distinguish it from the existing line. The line parameters of the added line should be identical to those of the existing line 2-5. Determine/explain the new line’s effect on $V_2$, the line loadings, and on the total real power losses. Please print a copy of your modified PowerWorld schematic and turn it in.