Problem #1:

Answer with the following parameters: \( \mu C_{ox} = 200\mu A/V^2 \), \( V_{th} = 0.4V \), \( C_{ox} = 40fF/\mu^2 \), and \( W/L = 80\mu/0.2\mu \).

1. Set the input DC bias \( V_b \) so that the output DC can be 0.6V?
2. In this bias condition, estimate the low-frequency small-signal gain \( v_{o}/v_{i} \).
3. Calculate the pole and zero frequencies if \( C_1 \) is the same as \( C_{gs} \).
4. What is the maximum peak-to-peak output swing you can get?
5. Now if \( C_1 \) is 1pF, sketch the Bode gain and phase plots.

Problem #2:

Now add a 6k resistor to the drain of the same amplifier given in #1. Assume the same bias condition stays the same.

1. What is the DC voltage at the drain?
2. Explain why the low-frequency small-signal gain \( v_{o1}/v_{i} \) is the same as derived in #1.
3. Estimate the low-frequency small-signal gain \( v_{o2}/v_{i} \).
4. If \( C_1=0 \) and \( C_2=1pF \), what is the -3dB bandwidth of this gain?
5. If \( C_1=C_2=1pF \), explain what happens.