1. From the output characteristic for the N Channel Enhancement Mode MOSFET obtained with the Keysight Curve Tracer used in lab, determine $K_P$, $V_{TO}$, and $\lambda$.

2. Design a common source single stage MOSFET amplifier circuit to have a small-signal gain with a linear magnitude of $10$. Bias the circuit so that the dc drain current is $1\, \text{mA}$. The small-signal input impedance is specified to be $100\, \text{k}\Omega$ and the small signal output impedance is $10\, \text{k}\Omega$. The load resistor is $43\, \text{k}\Omega$. The dc power supply voltages are $V^+ = +15\, \text{V}$ and $V^- = -15\, \text{V}$. Use the value of $K$, $\lambda$, and $V_{TO}$ measured from the curve tracer data in lab. The other parameters of the transistor are: $C_{GDO} = 2.5\, \text{nF} / \text{m}$ and $C_{GSO} = 2.5\, \text{nF} / \text{m}$. Pick $C_1 = C_2 = 0.22\, \mu\text{F}$, and $C_3 = 10\, \mu\text{F}$.

Verify the design with a SPICE analysis. Use a DC analysis to determine the bias. Use an AC analysis to plot the gain versus the frequency. Choose the lower frequency as $1\, \text{Hz}$ and the upper frequency $10\, \text{GHz}$. Mark the midband gain and the $-3\, \text{dB}$ frequencies. The SPICE parameters are $K_P$ ($2K$), $V_{TO}$ ($V_{TO}$), $\lambda$ ($\lambda$), $C_{GDO}$ ($C_{GDO}$), and $C_{GSO}$ ($C_{GSO}$). If the version of SPICE used requires the width ($W$) and length ($L$) of the channel use $10\, \mu\text{m}$ for each. Perform a transient analysis to determine the upper and lower clipping levels.