Problem 1 (25 points)

N-Type Enhancement

- \( V_T = 3V \)
- \( K = 250 \mu A/V^2 \)
- \( \eta = 0 \)

\[ I_D = K (V_{gs} - V_T)^2 \] - SAT Region

a) Draw the circuit for solving for the Bias.

b) For the Bias, show that the MOSFET is always SAT. (5 points)

c) Bias the circuit so that \( V_{DSQ} = 7.5V \) (10 points)

d) Find the midband gain \( V_{O/V_S} \). (Find an expression, do not solve for a numerical value.) (10 points)
Problem 2 (15 points)

Find an expression for the midband gain $\frac{V_o}{V_s}$.

Problem 3 (20 points)

Draw the Bode magnitude and phase plots for the circuit below.
Problem 4  (10 points)

Find the frequency of the pole due to $C_b$.

Problem 5  (20 points)

Find the midband gain $\frac{V_o}{V_s}$.
Using Miller's Theorem, find the value of $L_{eq}$ in terms of $L$ and $A$ from the original circuit.