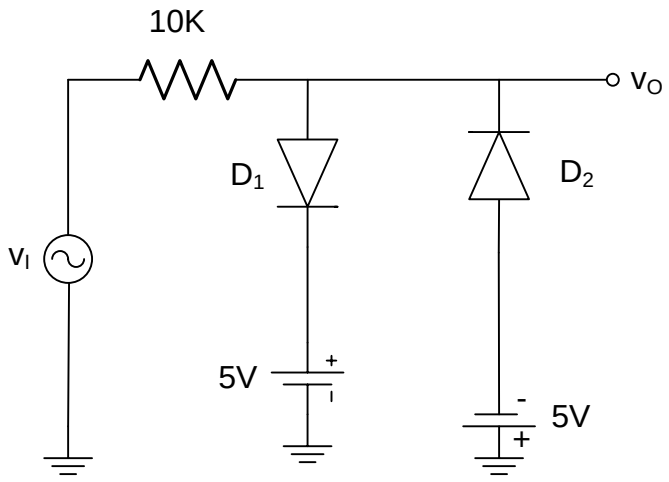
Problem 1

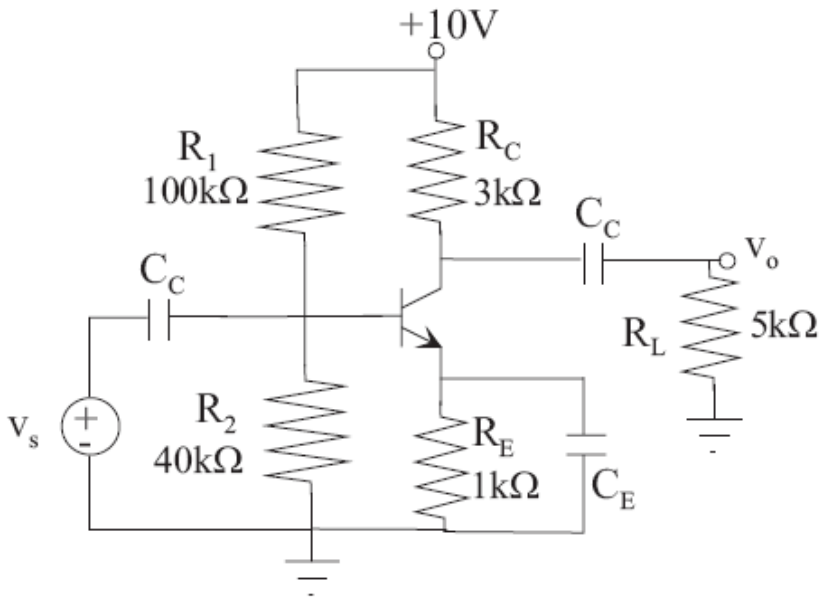
Consider the following circuit. Assume $V\gamma = 0.7V$, $R_F = 0$, $v_I = 10\sin(2\pi 100t)$ V.



Plot the transfer function v_O versus v_I (v_I in the range from -10V to 10V).

Problem 2

In the following circuit, the transistor has $\beta = 120$ and $V_{BE}(\text{on}) = 0.7\text{V}$.



a) (5 points) Determine the Q-point (I_C, V_{CE})
b) (5 points) Draw the dc and ac load lines.
c) (5 points) Draw the small-signal equivalent circuit.
d) **(5 points)** Determine the maximum symmetrical output voltage swing.
e) **(5 points)** Determine the input voltage v_s corresponding to the maximum swing in v_o

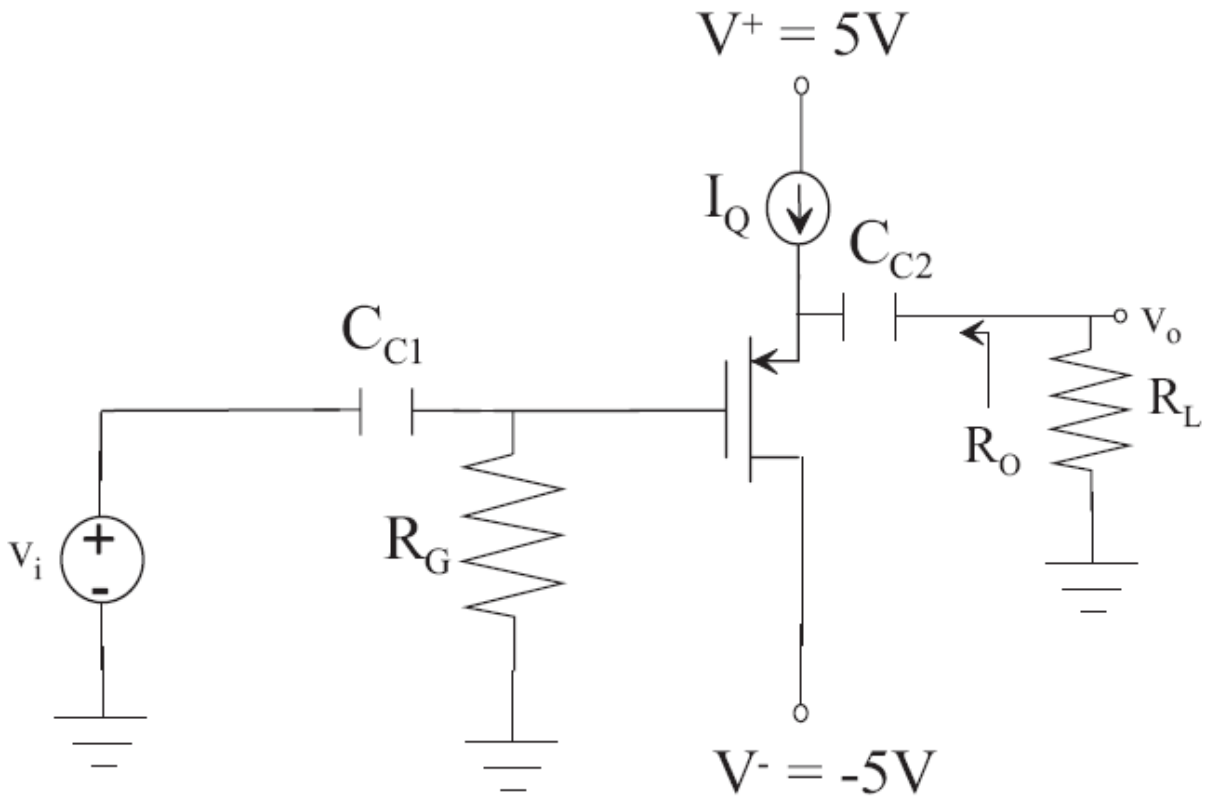
Problem 3

Consider the following circuit. Assume V_{TP} = -2V, K_p = 5mA/V^2, λ = 0.01 V^{-1}, R_G = 200kΩ, R_L = 20kΩ, I_Q = 0.5mA

a) (10 points) Determine I_D, V_{GS}, V_{DS}.

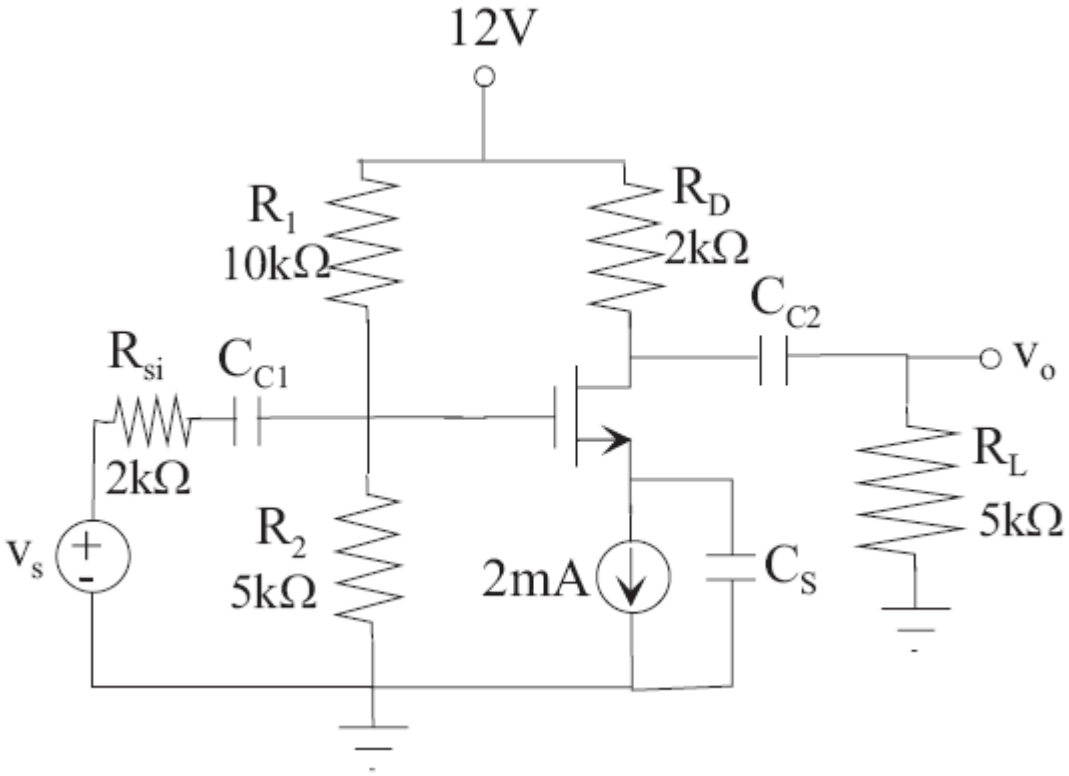
b) (10 points) Draw the small-signal equivalent circuit and determine the output resistance R_O

c) (5 points) Determine the voltage gain



Problem 4

In the following circuit, the transistor parameters are $V_{TN} = 2V$, $K_n = 2\ mA/V^2$, $\lambda = 0.01\ V^{-1}$



a) (5 points) Determine I_D, V_{DS}, and V_{GS}
b) (10 points) Draw the small signal equivalent circuit
c) (10 points) Determine the voltage gain