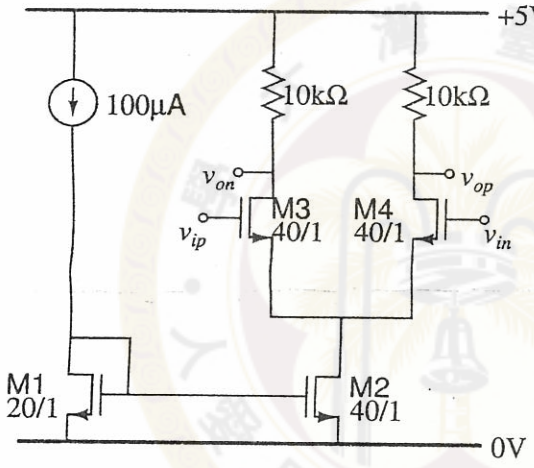
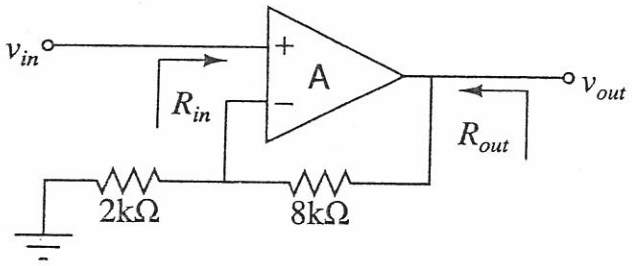
Please show your work leading to your answers. Please also make proper assumptions for your work.

1. (42%) For the following circuit, assume $\mu_n C_{ox}$ = 100 μA/V^2 and V_t = 0.7 V for all NMOS transistors.
   (a) Find the bias currents for M1, M2, and M3. (Please neglect body effect and channel length modulation effect. All transistors are assumed to be in saturation.) (15%)
   (b) Find the gain of the amplifier, where the gain is defined as $A_v=(v_{op}-v_{on})/(v_{ip}-v_{in})$. (Please neglect body effect and channel length modulation effect. All transistors are assumed to be in saturation.) (15%)
   (c) Will the gain increase, decrease, or stay the same if channel length modulation effect is considered in M3 and M4? (All transistors are assumed to be in saturation.) (6%)
   (d) Will the gain increase, decrease, or stay the same if channel length modulation effect is considered in M1 and M2? (Assume the transistors are biased such that the V_{DS} of M2 is 2V.) (6%)



2. (18%) Please find the resistivity of intrinsic silicon given that n_i=1.5×10^{10} cm^{-3}, μ_n = 1350 cm^2/V·s, and μ_p = 480 cm^2/V·s.
3. (20%) A MOSFET operating in the triode region can be used as a resistor when V_{DS} is small. Please find the resistance between the source and drain terminals for an NMOS transistor if $\mu_n C_{ox}$ = 100 μA/V^2, W/L = 10 μm/1 μm, V_t = 0.7 V, and V_{GS} = 1.2 V.
4. (20%) For the following feedback amplifier, what are the input resistance (R_{in}) and output resistance (R_{out}) if the gain of A is 200, the input resistance and output resistance of A are 50 kΩ and 1 kΩ, respectively?



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