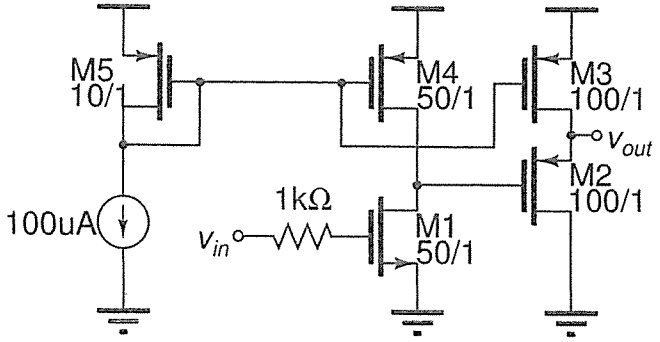
Please show your work leading to your answers. Please also make proper assumptions for your work.

1. (40%) Please find
   (a) (10%) the DC voltage of Vin (neglect channel length modulation effect for DC)
   (b) (10%) the small-signal voltage gain of the following circuit (v_{out}/v_{in})
   (c) (10%) the output resistance
   (d) (10%) the minimum supply voltage required for the following circuit such that all transistors operate in the saturation region.
   [$\mu_n C_{ox}$=120μA/V^2, $\mu_p C_{ox}$=50μA/V^2, V_{tn}= -V_{tp}=0.7V, and λ_n=λ_p=0.05V^{-1}]



2. (10%) Please find the resistivity of intrinsic germanium given that n_i=2.4×10^{13} cm^{-3}, μ_n= 3900 cm^2/V·s, and μ_p= 1900 cm^2/V·s.
3. (10%) Please draw a CMOS logic implementation of Y=AB+CD.
4. (40%) For the following trans-resistance amplifier circuit, Please find
   (a) (10%) the DC operating point of the transistor (I_{DS} & V_{GS}, neglect λ for DC),
   (b) (10%) the small-signal gain (v_{OUT}/i_{IN}),
   (c) (10%) the input resistance R_{IN},
   (d) (10%) the output resistance R_{OUT}.
   [note: i_{IN} is a small-signal current source, $\mu_n C_{ox}$=120μA/V^2, V_{tn}=0.5V, and λ_n= 0.02V^{-1}]