EE210A: Microelectronics I - Mini-Quiz 4

NAME (in capital)	Roll No

Time: 20 minutes

1) : For the transistor in the following circuit $\mu_n C_{ox} = 200\mu A/V^2$, $V_{tn} = 1V$, $W/L = 20$, $I_{DC} = 2mA$. Also, $V_{DD} = 6V$, $V_B = 4V$.

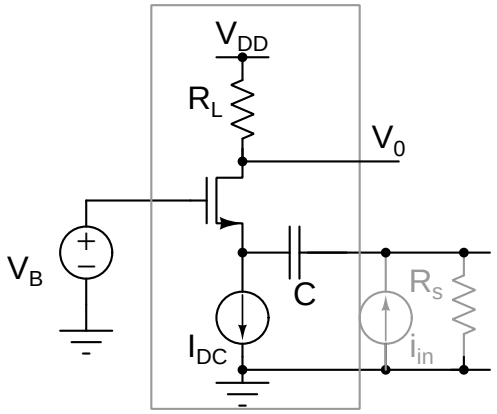


Fig. 1. Problem 1

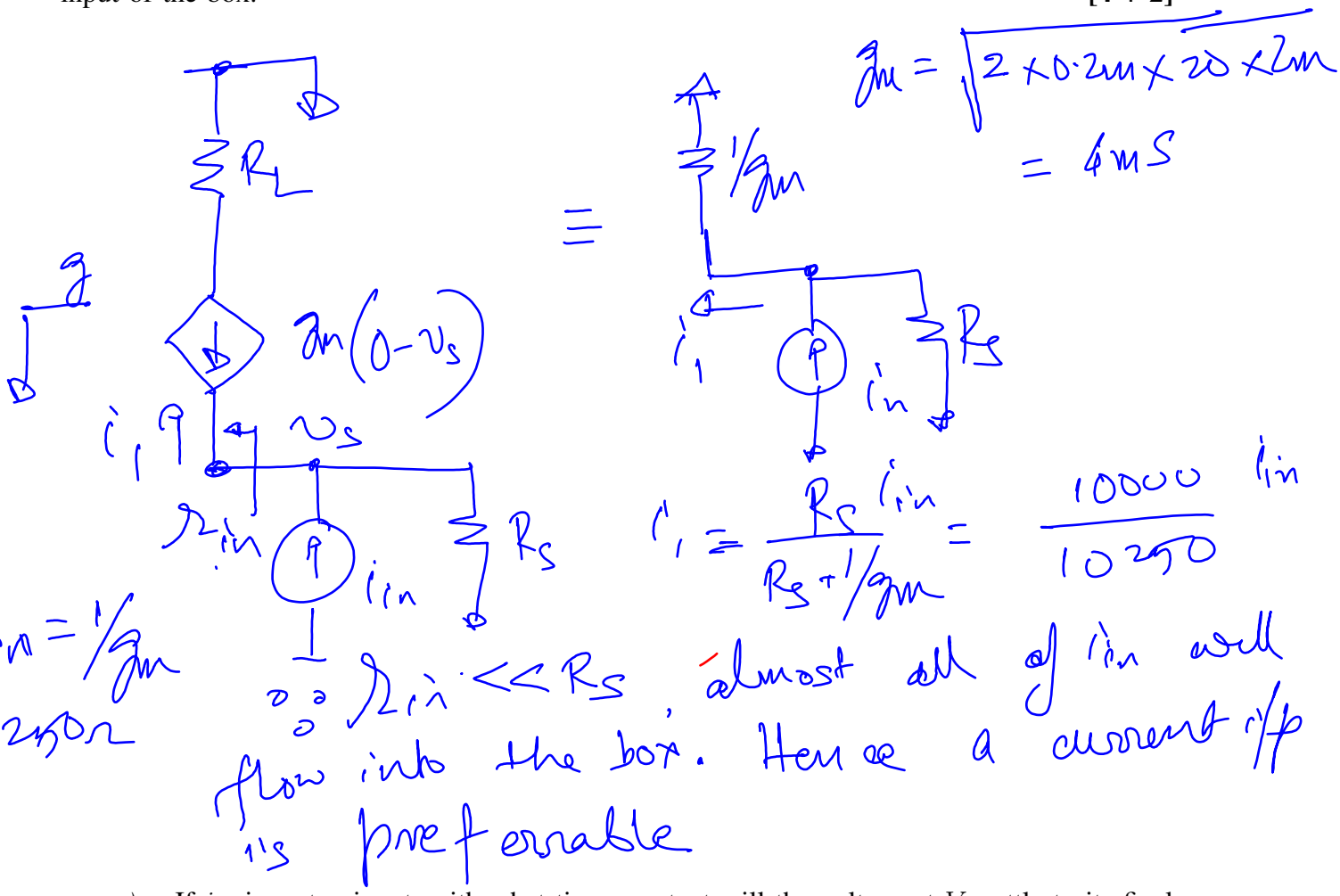
a) : Find the maximum R_L that you can have to keep the transistor in saturation under quiescent condition. **[2]**

$V_0 = V_{DD} - I_{DC} R_L \geq V_B - V_{tn}$

$\Rightarrow R_L \leq \dfrac{V_{DD} - V_B + V_{tn}}{I_{DC}}$

$= \dfrac{6 - 4 + 1}{2m} = 1.5\,K\Omega$

b) : Assume $i_{in} = I_p \sin(\omega_0 t)$, $R_s = 10k\Omega$ and C acts as a short circuit at ω_0. What fraction of the i_{in} flows into the transistor? Is the element inside the box more suited to accept a current input or a voltage input? Assume that the current source has an internal resistance of more than $10k\Omega$ (in parallel) and and the voltage source has a resistance more than $10k\Omega$ (in series). Elaborate your argument based on the fraction of the applied input that appears at the input of the box. **[4 + 2]**



c) : If i_{in} is a step input, with what time-constant will the voltage at V_0 settle to its final value? **[2]**