

EE210: Analog Electronics - Quiz 4

NAME (in capital)

Roll No

Time: 15 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, $V_{DD} = 6V$, $V_B = 4V$.

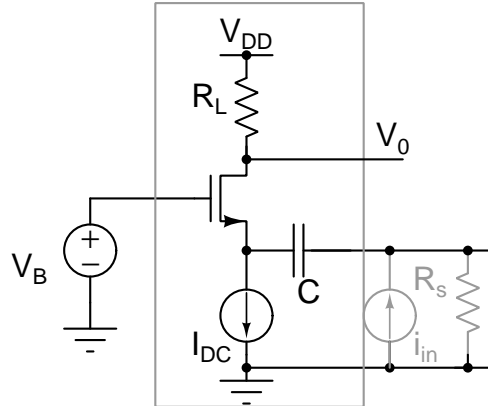


Fig. 1. Problem 1

a) : Find the maximum R_L that you can use while keeping the transistor in saturation under quiescent condition. [2]

Same as Set 1

$$R_L \leq \frac{6 - 4 + 1}{2} k$$

$$= 1.5 k\Omega$$

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). [4 + 2]

Same as set - 1

$$\frac{i_m}{i_{in}} = \frac{g_m R_s}{1 + g_m R_s}$$

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

$$\tau = \left(\frac{1}{g_m} + R_s \right)$$