EE210: Analog Electronics - Quiz 7

NAME (in capital)	Roll No

Time: 15 minutes

1) : All transistors in the figures are biased in saturation (biasing network has not been shown). Assume transconductance of $M1$ is g_{m1} and that of $M2$ is g_{m2}. Neglect CLM.

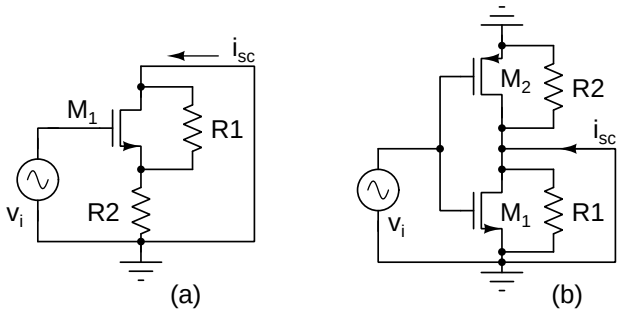
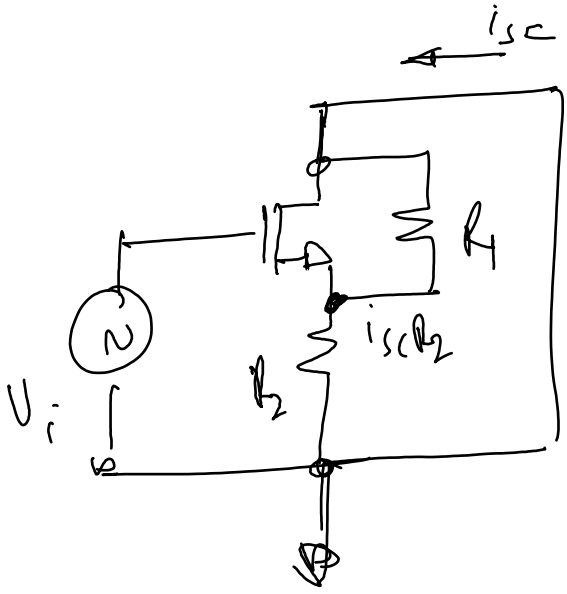


Fig. 1. Problem 1

a) : Find the small-signal short circuit current, i_{sc}, as indicated in Fig. (a). **[5]**



KCL @ the drain

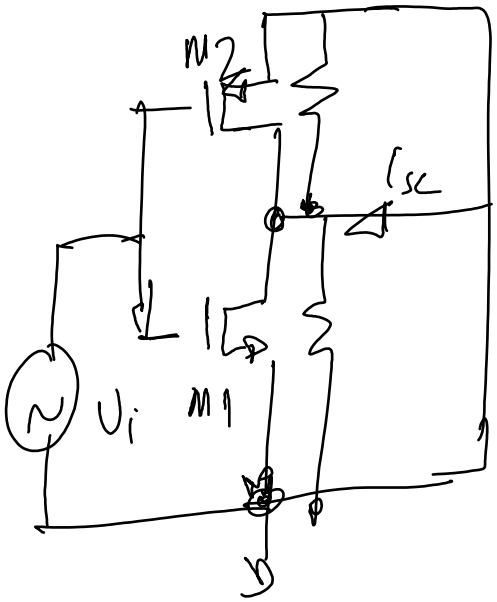
$$i_{sc} = g_m\left(v_i - i_{sc}R_2\right) + \left(\frac{0 - i_{sc}R_2}{R_1}\right)$$

$$\Rightarrow i_{sc}\left(1 + \frac{R_2}{R_1} + g_m R_2\right) = g_m v_i$$

$$\Rightarrow i_{sc} = \left(\frac{g_m v_i}{1 + g_m R_2 + \frac{R_2}{R_1}}\right)$$

contd..

b) : Find the small-signal short circuit current, i_{sc} as indicated in Fig. (b). **[5]**



$$i_{sc} = g_{m1} U_i + g_{m2} U_i$$

$$= (g_{m1} + g_{m2}) U_i$$