

EE210: Analog Electronics - Quiz 1

NAME (in capital)

Roll No

Time: 15 minutes

1) : In the figure shown below a voltage controlled current source (modeled in (b)) is being used network.

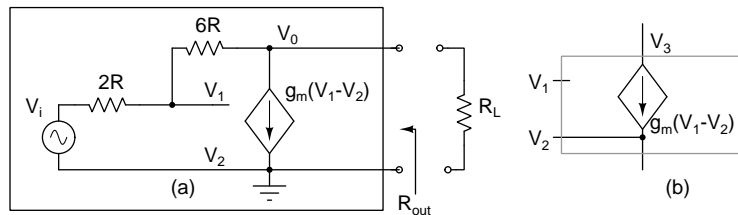
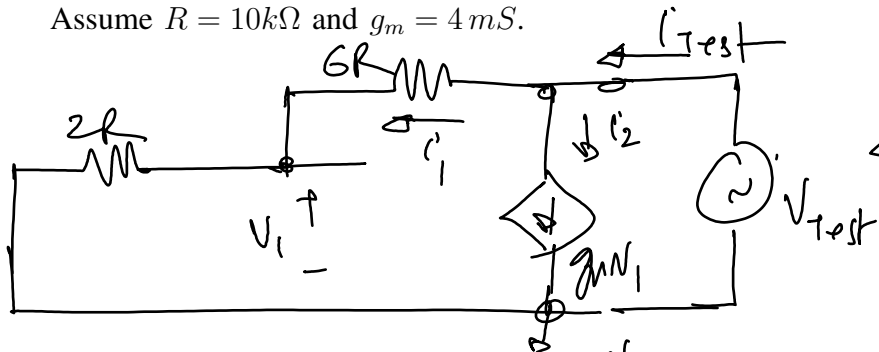


Fig. 1. Problem 1

a) : Sketch the Thevenin's equivalent network (without R_L) and mark the component values. Assume $R = 10k\Omega$ and $g_m = 4mS$. [8]



For R_{oc} (No credit if V_i is not shorted)

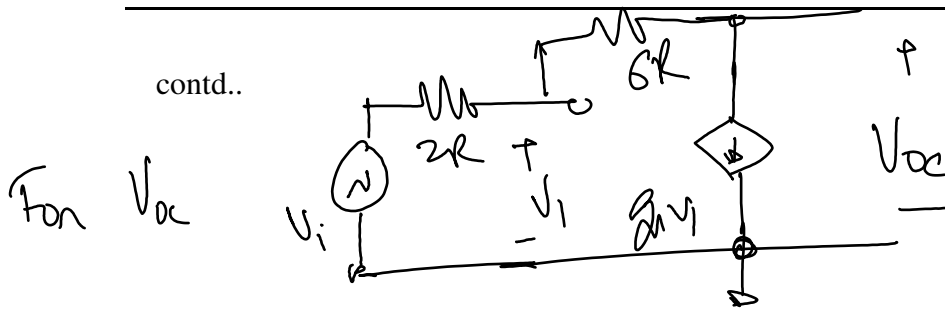
$$V_1 = \frac{V_{test}}{4} \quad i_1 = \frac{V_{test}}{8R} \quad i_2 = \frac{g_m V_{test}}{4}$$

$$\Rightarrow i_{test} = V_{test} \left(\frac{1}{8R} + \frac{g_m}{4} \right)$$

$$\Rightarrow \frac{V_{test}}{i_{test}} = \frac{1}{\frac{1}{80k} + 1m} \approx 1k\Omega$$

$$\Rightarrow R_{oc} = 1k\Omega$$

contd..

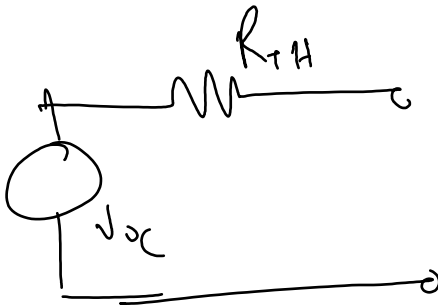


$$V_1 = \frac{6V_i + 2V_{oc}}{8} = \frac{3V_i + V_{oc}}{4}$$

$$\text{KCL @ } V_{oc} \quad \frac{V_i - V_{oc}}{2R} = g_m \left(\frac{3V_i + V_{oc}}{4} \right)$$

$$\Rightarrow V_i - V_{oc} = 80 (3V_i + V_{oc})$$

$$\Rightarrow V_{oc} \approx -3V_i$$



b) : If R_L is connected across the output terminal of (a), will the network behave more like a voltage or a current source given that $10k\Omega < R_L < 100k\Omega$. Justify your answer. [2]

$$\because R_{TH} \ll R_L \Rightarrow \text{No loading effect.}$$

$$\Rightarrow \text{Voltage source.}$$