

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.

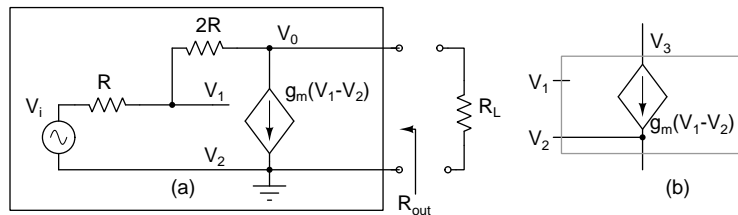
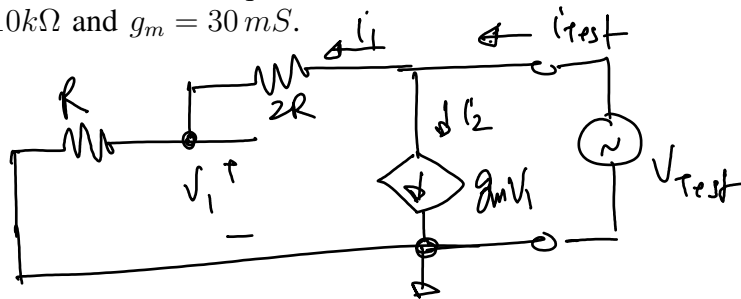


Fig. 1. Problem 1

a) : Sketch the Thevenin's equivalent network (without R_L) and mark the component values. Assume $R = 10k\Omega$ and $g_m = 30mS$. [8]

For R_{TH}



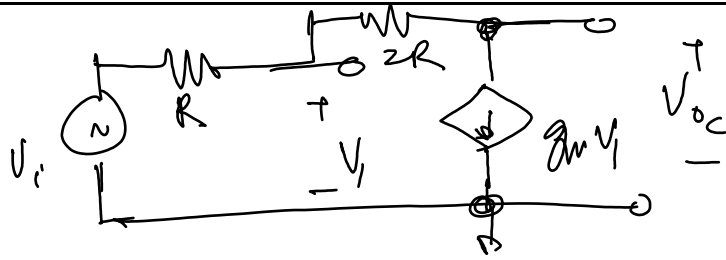
$$V_1 = \frac{V_{test}}{3} \quad i_1 = \frac{V_{test}}{3R} \quad i_2 = g_m V_1 = g_m \frac{V_{test}}{3}$$

$$\therefore i_{test} = V_{test} \left(\frac{1}{3R} + \frac{g_m}{3} \right)$$

$$\Rightarrow \frac{V_{test}}{i_{test}} = \frac{1}{\frac{1}{3R} + \frac{g_m}{3}} = \frac{1}{\frac{1}{30k} + 10m} \approx 100\Omega$$

$$\Rightarrow \boxed{R_{TH} \approx 100\Omega}$$

contd.. For V_{oc}



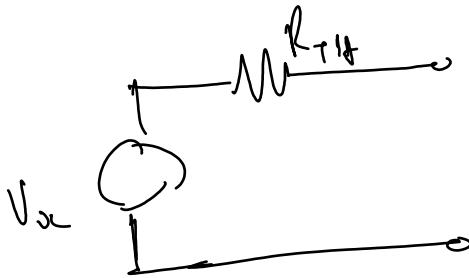
$$V_1 = \frac{2V_i + V_{oc}}{3}$$

KCL @ V_{oc}

$$\frac{V_i - V_{oc}}{2R} = 3\mu \left(\frac{2V_i + V_{oc}}{3} \right)$$

$$\Rightarrow V_i - V_{oc} = 300 (2V_i + V_{oc})$$

$$\Rightarrow V_{oc} \approx -2V_i$$



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 $1k\Omega < R_L < 10k\Omega$. Justify your answer. [2]

$$R_{TH} \ll R_L \Rightarrow \text{No loading effect due to } R_L$$

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