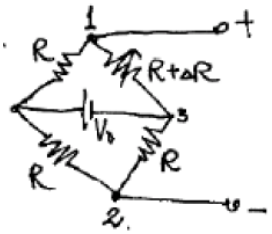
作业一解答

1-5 略

6.



先求 open-circuit voltage V_{oc}

$$V_{13} = V_1 - V_3 = \frac{R+\Delta R}{R+R+\Delta R} V_0 = \frac{R+\Delta R}{2R+\Delta R} V_0$$

$$V_{23} = V_2 - V_3 = \frac{R}{R+R} V_0 = \frac{1}{2} V_0$$

$$V_{oc} = V_{12} = V_{13} - V_{23}$$

$$= V_0 \left[\frac{1+\frac{\Delta R}{R}}{2+\frac{\Delta R}{R}} - \frac{1}{2} \right]$$

展开 $\frac{1}{2}\left[1+\frac{\Delta R}{R}\right]\left[1+\frac{\Delta R}{2R}\right]^{-1}$

$$\approx \frac{1}{2}\left(1+\frac{\Delta R}{R}\right)\left(1-\frac{\Delta R}{2R}+O\left[\left(\frac{\Delta R}{2R}\right)^2\right]\right)$$

$$\approx \frac{1}{2}+\frac{\Delta R}{2R}-\frac{\Delta R}{4R}+O\left[\left(\frac{\Delta R}{2R}\right)^2\right]$$

$$\approx \frac{1}{2}+\frac{\Delta R}{4R} \quad \because \frac{\Delta R}{R} \ll 1$$

$$\boxed{V_{oc} = \frac{\Delta R}{4R} V_0}$$

再求输出电阻 R_{th}，将 V_0 "除掉"（短路！）

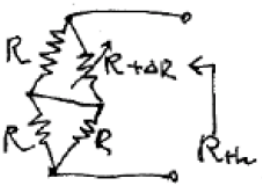
$$R_{th} = R /\!/ R + R /\!/ (R+\Delta R)$$

$$= \frac{1}{2}R + \frac{R(R+\Delta R)}{R+R+\Delta R} = R + \frac{\Delta R}{4} \approx R$$

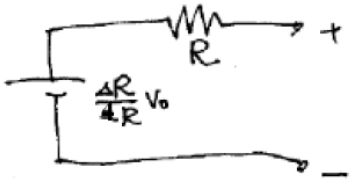
$$= \frac{R+\Delta R}{2+\frac{\Delta R}{R}}$$

$$= \frac{R}{2}\left(1+\frac{\Delta R}{R}\right)\left[1+\frac{\Delta R}{2R}\right]^{-1} = \frac{R}{2}\left[1+\frac{\Delta R}{R}\right]\left[1-\frac{\Delta R}{2R}+O\left(\frac{\Delta R}{R}\right)^2\right]$$

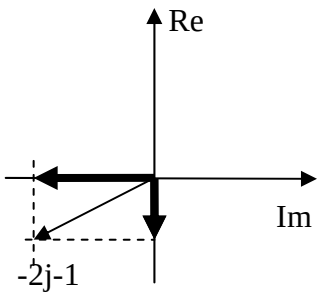
$$\approx \frac{R}{2}\left[1+\frac{\Delta R}{2R}\right] = \frac{R}{2}+\frac{\Delta R}{4}$$



戴维宁等效电路为



7.(1)



(2)