Physics 112

Preliminary Laboratory Questions Exp.4

network analysis II : Thevenin and Norton techniques

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For the circuit shown:









= 8 volt, =4 volt, R1=1 KΩ, R2=2 KΩ, R3=4 KΩ.

1. Use Thevenin’s equivalent circuit techniques to find the current passing through R3.

$$R\_{L}= R\_{3}$$

$$R\_{eq}=\frac{R\_{1}+ R\_{2}}{R\_{1} R\_{2}}=\frac{1×10^{3}×2×10^{3}}{\left(1+2\right)×10^{3}}=\frac{2}{3}Ω$$

$$ε\_{eq}=ε\_{1}-\frac{\left(ε\_{1}-ε\_{2}\right)R\_{1}}{R\_{1}+ R\_{2}}=8-\frac{\left(8-4\right)×1×10^{3}}{\left(1+2\right)×10^{3}}=\frac{20}{3}volt$$

$$I\_{R\_{L}}=I\_{R\_{3}}=\frac{ε\_{eq}}{R\_{eq}+R\_{L}}=\frac{ε\_{eq}}{R\_{eq}+R\_{3}}=\frac{20/3}{2/3 +(4×10^{3})}=1.67 mA$$

b) Use Norton’s equivalent circuit techniques to find the current passing through $R\_{3}$ .

$$ε\_{eq}=\frac{ε\_{1}}{R\_{1}}+\frac{ε\_{2}}{R\_{2}}=\frac{8}{1×10^{3}}+\frac{4}{2×10^{3}}=10 mA$$

$$I\_{R\_{L}}=\frac{I\_{eq}R\_{eq}}{R\_{eq}+R\_{L}}$$

$$I\_{3}=\frac{I\_{eq}R\_{eq}}{R\_{eq}+R\_{3}}=\frac{10×10^{-3}×2/3}{2/3 +(4×10^{3})}=1.67µA$$