Quiz #6 Ch27

Name: ID#: Sec#:

Q1 Each of the two real batteries in the figure has an *emf* of 20.0 V and an internal resistances r1 = 0.40Ω and r2 = 0.20Ω. What is the potential difference across each battery if the current in resistor R is 3.80 A?

i2

i1

r2

r1

ℰ1

ℰ2

a

b

R

i3

$$E\_{1}=E\_{2} $$

$$V\_{ab}=E\_{1}-i\_{1}r\_{1}=E\_{2}-i\_{2}r\_{2} ⇒ i\_{1}r\_{1}=i\_{2}r\_{2} ⇒ i\_{1}=\frac{r\_{2}}{r\_{1}}i\_{2} $$

$$But i\_{3}=i\_{1}+i\_{2} ⇒ i\_{3}= \frac{r\_{2}}{r\_{1}}i\_{2}+i\_{2}=\left( \frac{r\_{2}}{r\_{1}}+1\right)i\_{2} $$

$$ ⇒ i\_{2}=\frac{r\_{1}}{r\_{1}+r\_{2}} i\_{3}= \frac{0.4}{0.4+0.2}×3.8=2.53A$$

$$ ⇒ V\_{ab}=20-2.53×0.2=19.5 V$$