Gate Assignment

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Question

The voltage source $V_s = 10\sqrt{2}\sin(20000\pi t)$ V has an internal resistance of 50 ohms. The RMS value of the current through R is ___ (in mA) (rounded off to one decimal place).

Solution

$$V_s = 10\sqrt{2}\sin(20000\pi t) \text{ volts} \tag{1}$$

$$R_{\text{internal}} = 50 \text{ ohms} \tag{2}$$

$$R = 25 \text{ ohms} \tag{3}$$

$$Z = R + R_{\text{internal}} = 25 + 50 = 75\,\Omega \tag{4}$$

$$I_{\text{RMS}} = \frac{V_{\text{RMS}}}{Z} \tag{5}$$

$$V_{\text{RMS}} = \frac{10\sqrt{2}}{\sqrt{2}} = 10 \text{ volts} \tag{6}$$

$$I_{\text{RMS}} = \frac{10}{75} \times 1000 = \frac{2000}{15} \approx 133.3 \text{ mA} \tag{7}$$