Turn Ratio = 1/13.5

Voltage Gain = −3

take home answers

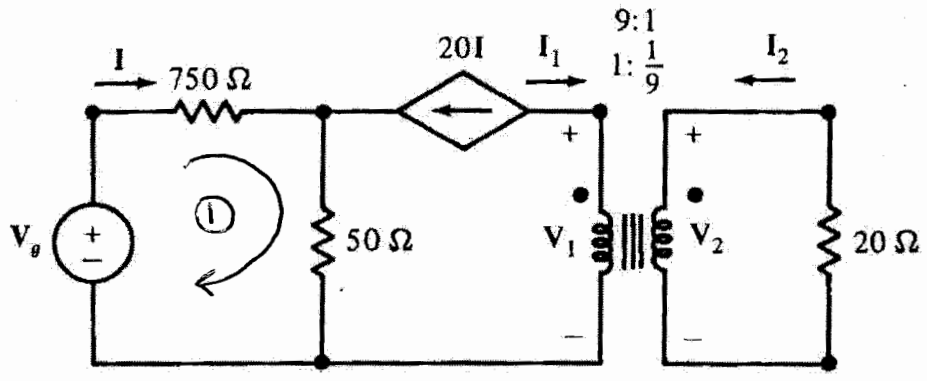
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE205: Electric Circuits II (092)
Dr. Ali Muqaibel
Quiz 5: Ideal Transformer

Serial # Key

-1 points for not writing your serial number

Name: KEY

For the given circuit calculate the voltage and power gains. The output voltage is V_2.



By KVL loop ①

$$V_g = 750\vec{I} + 50(21\vec{I})$$
$$= 1800\,\vec{I} \quad ②$$
$$\Rightarrow \vec{I} = \frac{\vec{V}_g}{1800}$$

Also $\vec{I}_1 = -20\vec{I} = -20\left(\frac{\vec{V}_g}{1800}\right)$
$$= -\frac{\vec{V}_g}{90} \quad ①$$

For the transformer

$$\vec{I}_2 = \frac{-\vec{I}_1}{1/9} = -9\,\vec{I}_1 \quad ②$$
$$= -9\left(\frac{-\vec{V}_g}{90}\right) = \frac{\vec{V}_g}{10}$$

$$\Rightarrow \vec{V}_2 = -20\,\vec{I}_2 = -20\left(\frac{\vec{V}_g}{10}\right) = -2\,\vec{V}_g \quad ①$$

$$\boxed{\frac{\vec{V}_2}{\vec{V}_g} = -2} \quad ①$$

The instantaneous power supplied by the independent voltage source

$$P_g = v_g i = v_g\left(\frac{v_g}{1800}\right) = \frac{v_g^2}{1800} \quad ①$$

the power absorbed by the 20 Ω load resistor is

$$P_2 = \frac{v_2^2}{20} = \frac{(-2v_g)^2}{20} = \frac{1}{5}v_g^2 \quad ①$$

Power Gain

$$\frac{P_2}{P_g} = \frac{(1/5)v_g^2}{v_g^2/1800} = 360 \quad ①$$

Good Luck, **Dr. Ali Muqaibel**