AP PHYSICS CH 21

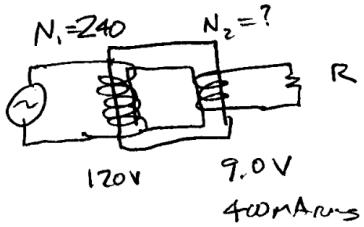
(1) $V_{RMS} = 100V \quad R = 5\Omega$

$\frac{V_{MAX}}{\sqrt{2}} = V_{RMS}$ so $V_{MAX} = \sqrt{2}\,V_{RMS} = \sqrt{2} \cdot 100 = 141\,V$

$I_{RMS} = \frac{V_{RMS}}{R} = \frac{100V}{5\Omega} = 20A \qquad I_{MAX} = \sqrt{2} \cdot 20 = 28.3A$

AC: JOULE HEATING → $P_{AV} = I_{RMS}^2 R = (20)^2 5 = 2000W$

(38)



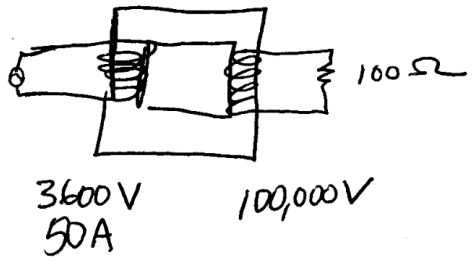
$\frac{N_1}{V_1} = \frac{N_2}{V_2}$ so $N_2 = N_1 \frac{V_2}{V_1} = 240\left(\frac{9}{120}\right) = 18$ TURNS

WHICH MAKES SENSE SINCE THIS IS A "STEP DOWN" TRANSFORMER!

SINCE $P_1 = P_2$ WE'LL CALCULATE P_2

$P_2 = VI = (9.0)(.400) = 3.6W$

(39)



WE NEED TO FIND A COUPLE OF THINGS... THE TOTAL POWER (WHICH WE'LL GET FROM THE PRIMARY), THE POWER AND CURRENT ON THE SECONDARY. WE DON'T KNOW HOW MANY TURNS ARE ON EITHER SIDE SO WE CALCULATE THE "TURNS RATIO"

$\frac{V_1}{N_1} = \frac{V_2}{N_2}$ SO $\frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{3600}{100{,}000} = .036$

NOW $N_1 I_1 = N_2 I_2$ SO $\frac{N_1}{N_2} = \frac{I_2}{I_1} \rightarrow .036 = \frac{I_2}{50}$

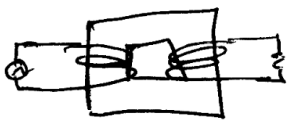
$I_2 = 1.8\,A$

NOW $P = I^2R = (1.8)^2 100\,\Omega = 324\,W$ LOST TO HEAT

OUT OF $P = VI = 3600(50) = 1.8 \times 10^5\,W$ TOTAL

$\frac{P_{LOST}}{P_{TOT}} \times 100\% = .18\%$

(41)



OK $1{,}000{,}000\,W = 10^6\,W$ IS 90% OF P_1

SO $1.11 \times 10^6\,W = P_1$

$P_1 = V_1 I_1$ SO $I_1 = \frac{P_1}{V_1} = \frac{1.11 \times 10^6\,W}{3600\,V} = 309\,A$

$P_2 = V_2 I_2$ SO $I_2 = \frac{P_2}{V_2} = \frac{10^6}{120} = 8333\,A$

(51) $c = \lambda f$ so $\lambda = \frac{c}{f}$ $\qquad \lambda = \frac{3 \times 10^8}{540 \times 10^3} = 555_m$

AND SO ON...

AM: (540 kHz $\longleftrightarrow$ 1600 MHz)

(555 m $\longleftrightarrow$ 188 m) YIKES! THAT'S BIG

FM: (88 MHz $\longleftrightarrow$ 108 MHz)

(3.4 m $\longleftrightarrow$ 2.7 m)