EE3006* Experiment-7 Lab Report

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October 2024

Hysterisis Loss Measurement

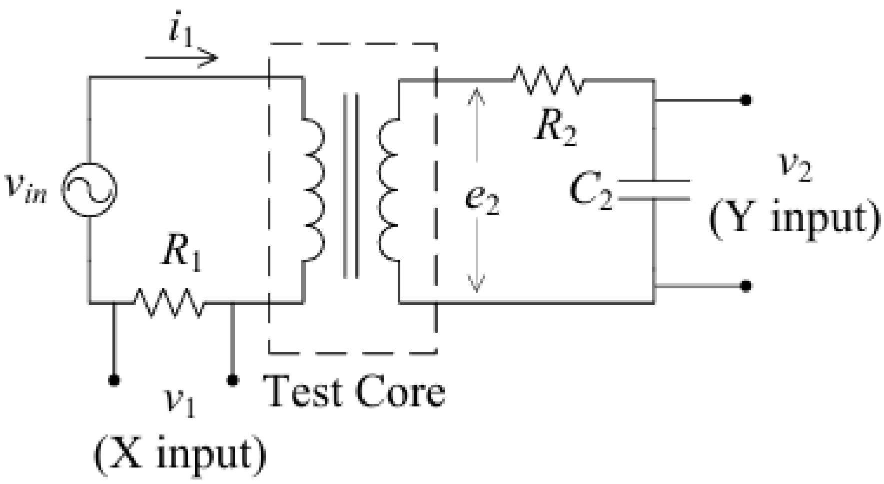


Figure 1: Circuit Diagram

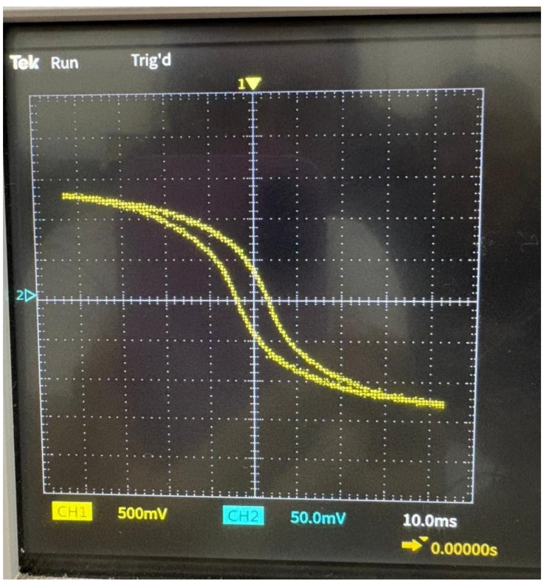
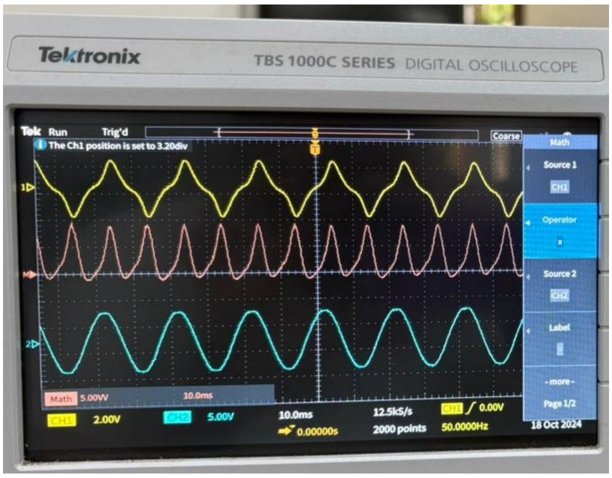
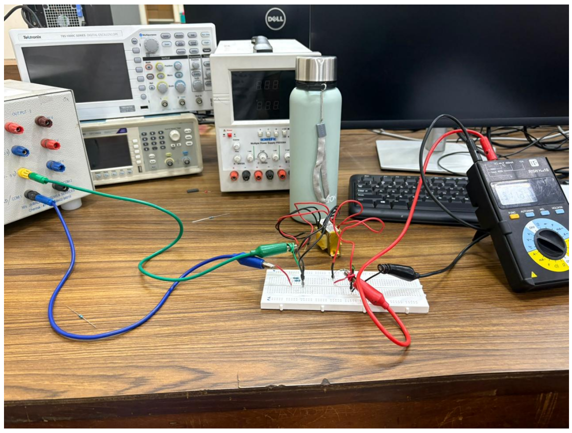


Figure 2: Hysterisis Graph



(a) Power curves



(b) Circuit construction

Values taken in experiment

f = 50Hz
$R_1 = 5Ohm$
$R_2 = 0.8MOhm$
$C_2 = 100nF$

Experimental measurements

Obtained voltages from experiment:
$V_1 = 1.066V$
$V_2 = 0.097V$
$A_H = 45 \times 10^-3m^3$

Calculating e2:

$$e_2 = 4.44 f N_2 A B s,$$

$$= 4.44*50*88*224*10^-6 * 0.75 * 0.95$$

$$=3.118V$$

Calculating H:

$$H = \frac{N_1 i_1}{l_m} = \frac{N_1}{l_m R_1} v_1 = \alpha_1 v_1$$

$$\alpha_1 = \frac{88}{81 \times 10^-3 \times 5}$$

$$= 217.3$$

$$H=\alpha_1 v_1$$

$=217.3\times1.066$

$=231.6418$ A/m

Calculating B:

$$B(t)=\frac{\phi}{A}=\frac{1}{AN_2}\int e_2dt=\frac{R_2C_2}{AN_2}v_2=\alpha_2v_2$$

$\alpha_2=\frac{10^6\times10^-7}{224\times10^-4\times88}$

$=5.07$

B$=\alpha_2v_2$

$=5.07\times0.097$

$=0.4918$ T

Calculating E:

X$_{sens}=50mV/div=5V/m$
$Y_{sens}=500mV/div=50V/m$

$$E=A_H.\alpha_1X_{sens}.\alpha_2Y_{sens}$$

$=45\times10^-3\times217.3\times5.07\times50\times5$

$=12394.25$ J

Calculating P:

$$P=\frac{Ef}{\rho}$$

$=0.081$ W/kg

Change the oscilloscope to XT mode. Use the MATH mode in the oscilloscope to multiply the signals vin and v1 and find the cycle average of the result. Scale it by a factor 1/R1. This gives the total power loss. Will it be different from the result obtained in part 10? Why?

Yes, the result obtained in part 11 will generally be different from that in part 10 because it includes eddy current losses in addition to the hysteresis loss. Hysteresis loss alone accounts only for energy lost due to the magnetic domain realignment, while the total power loss measured with × 1 v in ×v 1 in XT mode represents the combined losses (hysteresis and eddy current losses) in the core.