Physics 2220
Spring 2000
George A. Williams

FIFTH MIDTERM

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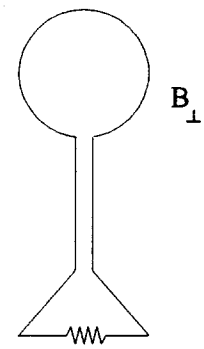
Discussion Section # _____ Student ID #: _____

SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

A coil, which has 15 turns, is in a region of space where the magnetic field is given by $B = B_o \cos \omega t$, where $B_o = 1.50 \times 10^{-5}$ T and $\omega = 266$ rad/s. The coil has a diameter of 5.25 cm. The wires from the ends of the coil are close together and outside the magnetic field there is a resistor $R = 150\ \Omega$ between the coils ends. If the coil is in the paper, B is perpendicular to the paper. Calculate all possible numbers.



(a) Find the magnitude of the EMF generated in the coil as a function of time.
(b) Calculate the magnitude of the current that flows through the resistor as a function of time.
(c) Determine the power dissipated in the resistor as a function of time.

a) $\varepsilon = -\frac{\partial \Phi}{\partial t} = \pi \left(\frac{d}{2}\right)^2 B_o \omega N \sin \omega t =$

$= 1.30 \cdot 10^{-4} \sin(266t)$ (V)

b) $I = \frac{\varepsilon}{R} = \frac{1.30 \cdot 10^{-4}}{150} \sin(266t) = 8.64 \cdot 10^{-7} \sin(266t)$ (A)

c) $P = IV = 1.12 \cdot 10^{-10} \sin^2(266t)$ (W)