(1)

13.9
10.8
15.8
6.3
46.8

4TH MIDTERM

Physics 172
Spring Quarter 1981
May 29, 1981

Ave ≃ 13.9

B test Av =

Name: Grader Sawyer

Discussion Instructor: Battelino Bruno DeSisto Gehrke Izatt
Roshko Sawyer Shastry

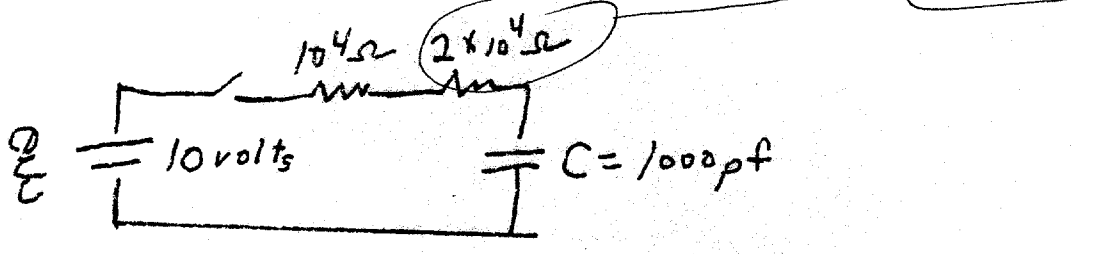
PROBLEM 1B

(a) Find the magnetic field 15 m from a long straight wire carrying a current of 125A. $1.7 \times 10^{-6}$ T 2 s.f. (2 s.f.)

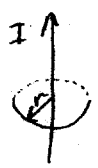
(b) Given a circular coil of radius 15 cm, and 17 turns. If it carries a current of 1.25A, find its magnetic dipole moment. 1.5 A·m² 2 s.f.

(c) Two long parallel wires carry a current of 18 A. If they are 3 cm apart, calculate the force per meter on each wire. $2 \times 10^{-3}$ N/m 1 s.f.

(d) In the circuit shown, calculate the time constant. $3 \times 10^{-5}$ s (1 s.f.)




a) $\oint \vec{B} \cdot d\vec{\ell} = \mu_0 I = 2\pi r B \Rightarrow B = \frac{\mu_0 I}{2\pi r} = \frac{5}{3} \times 10^{-6} = 1.67 \times 10^{-6}$




$\rightarrow B = 1.7 \times 10^{-6}$ T

b) $m = NIA = 17 \times 1.25\,A \times \pi (.15m)^2 = .478\pi = 1.50\ Am^2$

c) $\frac{F}{\ell} = \frac{\mu_0 I_1 I_2}{2\pi r} = \frac{4\pi \times 10^{-7}\ N/A^2 \times (18\,A)^2}{2\pi \times .03m} = 2.16 \times 10^{-3}\ N/m$

(see A test for derivation) $\rightarrow \frac{F}{\ell} = 2 \times 10^{-3}\ N/m$

d) $R_{eq} = R_1 + R_2 = 3 \times 10^4\ \Omega$ $\tau = R_{eq} C = 3 \times 10^4 \Omega \times 10^3 \times 10^{-12}$ F

$\tau = 3 \times 10^{-5}$ s