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SEE IMPORTANT MARKING INSTRUCTIONS ON SIDE 2

LAST NAME KEY FIRST NAME MI

PURDUE UNIVERSITY CIS-11

USE A #2 PENCIL ONLY

	T	F
1	A	
2	A	
3		C
4	B	
5		E
6	T	
7	T	
8		E
9	T	
10		C
11		B
12		B
13		B
14		C
15	T	

COMPLETE ALL INFORMATION AS DIRECTED

SECTION NUMBER	TEST/QUIZ NUMBER	STUDENT IDENTIFICATION NUMBER
	02	

INSTRUCTOR Barnes

COURSE Physics 241

DATE 7 March 2003

SIGNATURE KEY

KEY

PHYSICS 241 TEST 2 Monday, April 7, 2003

This 14-question test (each question is worth approximately 7.14 points) is worth 100 points, each question is weighted equally. Please fill out the answer sheet with soft lead pencil. Be sure to give your name, student ID #, date, Course #, Test 2, and ****SIGN**** the answer sheet. Be prepared to present your Student picture ID card when handing in your answer sheet. You may keep the sheets with the questions and your work.

Pick the nearest value for your answer (there may be slight round-off errors). If your answer is significantly different from all possible answers, you have made some mistake.

Don't get hung up too long over any one question until you have tried all of them.

You are expected to bring your own sheet of equations and words explaining the equations. Here are a few possibly useful constants.

ϵ_o = 8.85×10^{-12} $C^2/(Nm^2)$ or F/m

$k = 8.99 \times 10^9$ $Nm^2/C^2 = 1/4\pi\epsilon_o$

$\mu_o = 4\pi \times 10^{-7}$ Tm/A = 1.257×10^{-6} Tm/A

$e = 1.60 \times 10^{-19}$ C = $-q_{electron} = q_{proton}$

$c = 3.00 \times 10^8$ m/s

$g = 9.8$ m/ s^2

$G = 6.67 \times 10^{-11}$ Nm^2/kg^2

weight = mg

1.) A real battery of emf $\mathscr{E} = 25.0$ V and internal resistance $r = 10.0\ \Omega$ is connected in series with an external load resistor $R = 3.08\ \Omega$. What is the so-called "terminal voltage" of the real battery in this circuit, measured in Volts? (equivalently, what is the voltage across the external load resistor?)

a) 25.0
b) 5.89
c) 2.50
d) 8.12
e) 19.1

2.) A long solenoid with a radius of 40.0 mm has 1000 turns/m. A single circular loop of radius 70.0 mm is placed around the solenoid. The central axis of the loop coincides with the central axis of the solenoid. The magnetic field in the solenoid decreases uniformly from 0.200 T to 0.0500 T in 0.0200 s. Seen from an end, the solenoid current flows clockwise. Seen from this same end, the induced current in the loop flows:

a) Zero
b) Clockwise
c) Counter-clockwise

3.) In the previous problem, what is the magnitude of the magnetic flux in webers through the single turn loop at the instant that B = 0.150 T?

a) 2.31×10^{-3}
b) 3.47×10^{-3}
c) 1.89×10^{-2}
d) 7.54×10^{-4}
e) 0

4.) In the plane of the paper a long straight wire carries a current I = 3.00A in the +x direction. In the plane of the paper a proton of charge +e moves with speed v = 200.0 m/s in the +x direction at a distance of 0.250 m below the wire, as shown. The wire exerts a magnetic force on the proton that is:

a) Into the paper
b) Away from the wire
c) Toward the wire
d) Out of the paper
e) In the direction of the current flow in the wire

5.) A In the above problem, at the location of the proton, the magnitude of the magnetic field due to the long wire, in Teslas, is?

a) 1.51×10^{-5}
b) 5.02×10^{-6}
c) 4.85×10^{-6}
d) 3.14×10^{-5}
e) 2.40×10^{-6}

6.) An LC circuit (negligible resistance) oscillates with a frequency f = 150 Hz. If L = 0.0025 H, what is the value of the capacitance C in microFarads?

a) 450
b) 0.00222
c) 21.2
d) 0.0228
e) 56.2

7.) A In the above problem, if the total energy stored in the capacitor and inductor is 0.0010 J, what is the maximum current, i_{max}, in Amperes that flows in the circuit?

a) 0.894
b) 1.60
c) 0.400
d) 5.800
e) 1.26

8.) In the LC circuit above, the root mean square (rms) current equals:

a) $\sqrt{2}\ i_{max}$
b) 0
c) i_{max}
d) $i_{max}/2$
e) $i_{max}/\sqrt{2}$

9.) A capacitor is charged to 88.7 microCoulombs, then connected to a resistor R = 2.3 MΩ such that the two are in series. At a time t = 81 s after the circuit is made, the charge on the capacitor is 7.7 μC. What is the value of the capacitance, C, in μF?

a) 14.4
b) 2.49
c) 4.98
d) 8.30
e) 0.83

10.) An inductor L and a 177 Ω resistor, in series, are connected to a 60 Hz 115 V (AC) electric outlet (peak voltage $\mathcal{E}_{max}$ = 162.6 V). The peak current through the circuit is 750mA. What is the value of the inductance L, in Henrys? (Hint: first find the impedance, Z, of the circuit. Later, remember to use the ANGULAR driving frequency!).

a) 3.25
b) 117
c) 0 332
d) 2.34
e) 0.0157

11.) Compute the inductance per unit length of an infinite solenoid coil. The cross sectional area is $A = 0.8\ m^2$ and $n = 950$ turns per meter. A current $i = 23$ A flows in the coil.

a) 0.49 H/m
b) 0.91 H/m
c) 0.36 H/m
d) 1.12 H/m
e) 2.85 H/m

12.) A conducting bar slides northward at 75 km/h along a pair of straight rails in a region where the Earth's magnetic field has a vertical component of 0.50×10^{-4} T. The two rails are connected together by highly conducting wires. The emf induced between the East and West ends of the bar, separated by 1.7 m, is:

a) 0
b) 1.8 mV
c) 3.6 mV
d) 6.4 mV
e) 13 mV

13.) A circular loop of wire with a radius of 20 cm lies in the xy plane and carries a current of 2 A, counterclockwise when viewed from a point on the positive z axis. Its magnetic dipole moment is:

a) 0.25 Am^2 , in the negative z direction
b 0.25 Am^2 , in the positive z direction
c) 2.5 Am^2 , in the positive z direction
d) 2.5 Am^2 , in the negative z direction
e) 0.25 Am^2 , in the xy plane

14.) An infinite solenoid with a circular cross section of area 15 cm^2 carries a current of 2500 A. The solenoid has n = 600 turns per meter along its length. What is the magnitude of the B field in the center of the solenoid?

a) 0.72 T
b) 0.62 T
c) 1.88 T
d) 2.6 T
e) 3.44 T