Date: June 2018

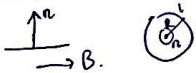
Duration: 90 minutes

SUBJECT: **PHYSICS 3**	
Chair of Department of Physics: Signature: Full name: Phan Bảo Ngọc	Lecturers: Dương Hoài Nghĩa, Phan Bảo Ngọc Signature:

INSTRUCTIONS: This is a closed book examination. Use of cell phones, laptops and dictionaries is not allowed.

1/ (20 pts) A potential difference of 300 V is applied to accelerate an electron from rest. The electron then enters a uniform magnetic field and it takes 12 ns to complete one revolution: **(a)** Calculate the speed of the electron; **(b)** Find the radius of the orbit of the electron. ($e = 1.6\times10^{-19}$ C; $m_e = 9.1\times10^{-31}$ kg)

2/ (20 pts) The plane of a circular loop wire is parallel to a 2.0-T magnetic field. The loop has a radius of 4.0 cm and carries a current of 6.0 A. Calculate the magnitude of the torque that acts on the loop. ($\tau = NiAB\sin\theta$)



3/ (20 pts) A segment of wire is formed into the shape as shown in Figure 1, and carries a current I = 2.0 A. Find the magnitude and the direction of the resulting magnetic field at point P if R = 10 cm.

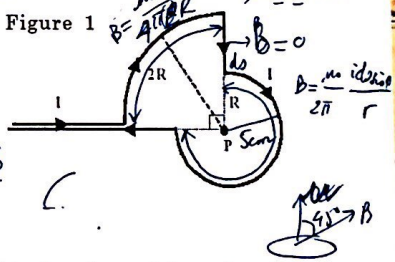


Figure 1

($B = \frac{\mu_0 i\phi}{4\pi r}$; $\mu_0 = 4\pi\times10^{-7}$ T.m/A)

4/ (20 pts) A 100-turn coil is placed in a magnetic field so that the normal to the plane of the coil makes an angle of 45^0 with the direction of the magnetic field. An induced emf of 100 mV appears in the coil if we increase the magnetic field from 300 μT to 600 μT in a time interval of 1.0 s. Find the cross sectional area of the coil.

5/ (20 pts) The resonant frequency of a series RLC circuit is 5.0 kHz. When it is driven at a frequency of 7.0 kHz, it has an impedance of 850 Ω and a phase constant of 45^0. Find R, L, and C for this circuit.

END OF QUESTION PAPER

Thứ
Ngày . . No.

June 2018 - Nguyễn Trọng Nghĩa

i had fun being your TA. But dont let me see your face in Phy3 class again ~~xxx~~ plz :(((

1)

a) $K = \frac{1}{2} m_e v^2 = U.e = 4.8 \times 10^{-17}$ (J)

b) $v = \sqrt{\frac{2 \times 4.8 \times 10^{-17}}{m_e}} = 1.02 \times 10^7$ (m/s)

b) $T = \frac{2\pi r}{v} \Rightarrow r = \frac{Tv}{2\pi} = 0.02$ (m) or 2 cm

You can actually see this orbiting of a beam of ~~the~~ electrons in A1.504 (you'll need to switch to physics, tho)

2)

$\tau = NiAB \sin 90° = 1 \times 6 \times \pi 0.04^2 \times 2 = 0.06$ (J)

3)

$\vec{B_p}$ created by the bigger arc is pointing into the page

$\vec{B_s}$ // smaller //

$\Rightarrow B_{net} = B_l + B_s = \frac{\mu_0 \times 2 \times \frac{\pi}{2}}{4\pi \times 2 \times 0.1} + \frac{\mu_0 \times 2 \times \frac{3\pi}{2}}{4\pi \times 0.1}$

$= 1.1 \times 10^{-5}$ (T)

4)

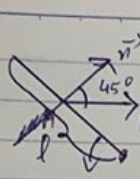
~~$|\mathcal{E}| = \left|\frac{d\Phi_B}{dt}\right| = A \cdot \frac{dB}{dt} \Rightarrow A = 0$~~ $\frac{dB}{dt} = 300$ (T/s)

$|\mathcal{E}| = N \left|\frac{d\Phi_B}{dt}\right| = N.A.\frac{dB}{dt} \Rightarrow A = \frac{10}{3}$ (m^2)

Cái hay của bài này là normal vector tạo góc 45° với $\vec{B}$

+ Cái A mình vừa tính chỉ là Area mà $\vec{B}$ đi qua thôi

+ vì góc này là 45° nên A này nhỏ hơn $A_{thật}$ của loop



Có một công thức thấy dạy thì:

Từ trường

$\phi_B = B.A.\cos\theta$

Từ thông Area góc tạo bởi $\vec{n}$ và $\vec{B}$

Hay nói cách khác, A_n thật của loop là:

$A_n = \frac{A}{\cos 45^\circ} = 4.71\ (m^2)$

51

$\cos\phi = \frac{R}{Z} \Rightarrow R = \cos 45^\circ \times Z$

$= 601\ \Omega$

$850 = \sqrt{601^2 + (X_L - X_C)^2} \Rightarrow (X_L - X_C)^2 = 601^2$

vì phase constant $= 45^\circ \Rightarrow X_L > X_C$

$\Rightarrow X_L - X_C = 601\ (1) \Rightarrow X_L - X_C = 601\ \Omega$

$\Rightarrow \omega_d L - \frac{1}{\omega_d C} = 601\ (1)$

$\omega L - \frac{1}{\omega C} > 0$

We also have:

$f_d = 7000 \Rightarrow \omega_d = 14000\pi$ (rad/s)

$\omega L - \frac{1}{\omega C} = 0\ (2)$

$f = 5000 \Rightarrow \omega = 10000\pi$ (rad/s)

from (1) and (2)

$$\Rightarrow \begin{cases} 14000\pi L - \frac{1}{14000\pi C} = 601 \\ 10000\pi L - \frac{1}{10000\pi C} = 0 \end{cases} \Rightarrow \begin{matrix} L = 0.028\ H \\ C = 3.86 \times 10^{-7}\ F \end{matrix}$$

KOKUYO