INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY - HCMC

FINAL EXAMINATION

Student Name:_____ Student ID:_____

Date: January, 2019

Duration: 90 minutes

SUBJECT: PHYSICS 3	
Head of Department of Physics: Signature: Full name: Phan Bao Ngoc	Lecturers: Signature: Full name: Phan Bao Ngoc, Dao Ngoc Hanh Tam

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

Q1 (20 pts):

A wire 230 cm long carries a current of 12.0 A is put in a uniform magnetic field of magnitude B = 3.0 T. The magnetic force on the wire is measured as 41.4 N. Find the angle of the wire with the magnetic field.

Q2 (20 pts):

A loop having two semicircles of radii a = 5.7 cm and b = 8.5 cm with a common center **P**. A current i = 50 mA is set up in that loop (as shown in ***Fig.1***). Find the ***magnitude*** and ***direction*** of the magnetic field at **P**. (the permeability constant $\mu_o = 4\pi \times 10^{-7}$ Tm/A)

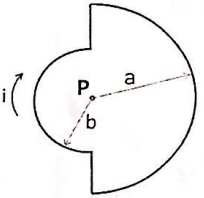

Fig. 2

Q3 (20 pts):

A metal rod is forced to move with constant velocity v = 65 cm/s along two parallel metal rails (***Fig.2***). A magnetic field with magnitude B = 0.35 T points out of the page. The rails are separated by L = 20 cm.

a) What emf is generated?

b) The rod has a resistance of 18.5 Ω (resistance of the rails and connector are negligible). What is the current in the rod?

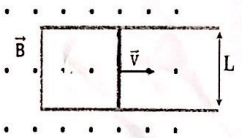

Fig. 2

Q4 (20 pts):

In an oscillating LC circuit with C = 64.0 mF, the current is given by $i = (1.6)\sin(2500t + 0.68)$, where t is in seconds, i in amperes, and the phase constant in radians.

a) How soon after t = 0 will the current reach its maximum value?

b) Find the inductance L and the total energy.

Q5 (20 pts):

The ac generator in ***Fig.3*** supplies 120 V at 60 Hz. When the switch ***S*** opens, the current leads the generator emf by 20°. When ***S*** is in position 1, the current lags the generator emf by 10°. When ***S*** is in position 2, the current amplitude is 2 A. Find R, L, and C.

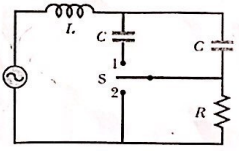

Fig. 3

- END OF QUESTION PAPER -

Thứ
Ngày . . No.

Jan 2019 - Nguyễn Trọng Nghĩa

well, whatever
Try your best
please know that I do
wish the best for you.

11

$\Sigma F_b = iLB\sin\phi$

$\Leftrightarrow 41.4 = 12 \times 2.3 \times 3 \times \sin\phi \Rightarrow \phi = \sin^{-1}\left(\frac{41.4}{12 \times 2.3 \times 3}\right)$

$= 30°$

b) 21

$\vec{B}_{net}$ is ⊙ pointing into the page

$|\vec{B}_{net}| = \frac{\mu_0 \times 50 \times 10^{-3} \times \pi}{4\pi \times 0.057} + \frac{\mu_0 \times 50 \times 10^{-3} \times \pi}{4\pi \times 0.055} = 4.6 \times 10^{-7}\ T$

31

a) $|\mathcal{E}| = \left|\frac{d\Phi_B}{dt}\right| \Rightarrow \mathcal{E} = \frac{d(BA)}{dt} = B.\frac{dA}{dt} = B.\frac{d(Lx)}{dt}$

b) $i = \frac{\mathcal{E}}{R} = \frac{0.0455}{18.5} = 2.46 \times 10^{-3}\ (A)$ $= B.L.\frac{dx}{dt}$

$= BLv$

$= 0.0455\ V$

41

a) $i_{max} \Rightarrow \sin(2500t + 0.68) = 1$

$\Leftrightarrow 2500t + 0.68 = \frac{\pi}{2}$

$\Leftrightarrow t = 3.56 \times 10^{-3}\ (s)$

b)

$2500 = \frac{1}{\sqrt{LC}} \Rightarrow L = \frac{1}{2500^2 \times 64 \times 10^{-3}} = 2.5 \times 10^{-6}\ (H)$

Total energy:

$U = \frac{1}{2}LI^2 = \frac{1}{2} \times 2.5 \times 10^{-6} \times 1.6^2$

$= 3.2 \times 10^{-6}\ (J)$

Thứ
Ngày . . No.

5/

- When S at 2.

$\frac{\mathcal{E}}{Z} = 2 \Rightarrow Z = 60\ \Omega$

$\Rightarrow 60 = \sqrt{(X_L - X_{1C})^2} \Leftrightarrow (X_L - X_{1C})^2 = 3600$ (1)

- When S open.

$\tan\phi = \frac{X_L - X_{1C}}{R} \Leftrightarrow \frac{-60}{R} = \tan(-20^\circ) \Rightarrow R = 164.85\ \Omega$

(Because the current lead $\rightarrow \phi = -20^\circ$ and $X_{1C} > X_L$)

- When S at 1:

$\tan 10^\circ = \frac{X_L - X_{2C}}{R} \Leftrightarrow X_L - X_{2C} = 29\ \Omega$ (2)

Let's take a look at (1)

↳ From Sopen, we know that $X_L < X_{1C} \Rightarrow X_L - X_{1C} = -60\ \Omega$ (3)

(2) and (3)

$$\begin{cases} 120\pi L - \frac{1}{120\pi C} = -60 \\ 120\pi L - \frac{1}{120\pi 2C} = 29 \end{cases} \Rightarrow \begin{cases} L = 0.3\ H \\ C = 1.47 \times 10^{-4}\ F \end{cases}$$