INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY - HCMC

FINAL EXAMINATION – CLASS

Student Name:_____ Student ID:_____

Date: June 2017

Duration: 100 minutes

SUBJECT: PHYSICS 3	
Chair of Department of Physics: Signature: Full name: Phan Bảo Ngọc	Lecturer: Signature: Full name: Phan Bảo Ngọc

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

1/ (20 pts) A straight wire of linear mass density 0.08 kg/m is located perpendicular to a magnetic field of 0.7 T as shown in Figure 1. Find the magnitude and the direction of the current needed to balance the gravitational force on the wire. 1,142

Figure 1

2/ (20 pts) Determine the magnitude and the direction of the magnetic field at the center of the circular arcs, point O (Figure 2). The current in the loop is 6.0 A, $r_1 = 2$ cm and $r_2 = 4$ cm. ($B = \frac{\mu_0 I \theta}{4\pi R}$; $\mu_0 = 4\pi \times 10^{-7}$ T.m/A) $4,7.10^{-5}$

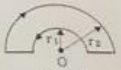

Figure 2

N A

3/ (20 pts) A coil consists of 200 turns. Each turn encloses an area of 0.65 m^2. Find the rate of change of a magnetic field parallel to the axis of the coil to induce a current of 0.12 A. The resistance of the coil is 300 Ω. 0,28

i R

4/ (20 pts) A battery is connected to a series RL circuit at time t = 0. If R = 10 Ω and L = 200 mH, at what time will the current be 47% less than its equilibrium value? (Rise of current $i = i_0(1 - e^{-t/\tau_L})$) 0,0151

5/ (20 pts) In Figure 3, R = 20.0 Ω, C = 10 μF, and L = 50.0 mH. The generator provides an emf with rms voltage 100.0 V and frequency 500 Hz. 31,83 500

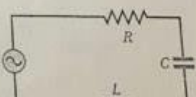

Figure 3

$V_{rms} = \frac{V}{\sqrt{2}} \Rightarrow V = 100\sqrt{2}$ $f = 500Hz$

(a) Find the rms current. 0,788 $\phi = 86,9$

(b) What is the rms voltage across R and C together. 40,84

(c) At what average rate is energy dissipated in R, in C, and in L? 12,41 19,76 97,54

END OF QUESTION PAPER

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1/ Thú vị

The gravitational force per unit length is:

$$\frac{F_g}{L} = \frac{mg}{L} \quad \left(\frac{m}{L} = \lambda\right)$$

$$\Rightarrow \frac{F_g}{L} = \lambda g = 0.08 \times 9.8 = 0.784 \ (N/m)$$

To Balance out F_g, F_b must:

+ equal magnitude (1)
+ pointing upward => current is from left to right

$$(1) \Rightarrow F_b = F_g$$

$$\Leftrightarrow \frac{F_b}{L} = \frac{F_g}{L} \Leftrightarrow iB = 0.784$$

$$\hookrightarrow i = 1.12 \ (A)$$

2/

The $\vec{B_l}$ created by lower arc is pointing out of the page

$\vec{B_u}$ // upper // into the page

$$B = B_l - B_u = \frac{\mu_0 \times 6 \cdot \frac{1}{2}\pi}{4\pi \times 0.02} - \frac{\mu_0 \times 6\pi}{4\pi \cdot 0.04} = 4.71 \times 10^{-5} \ (T)$$

The direction of $\vec{B}$ is out of the page

3/

$$\mathcal{E} = iR = 0.12 \times 300 = 36 \ (V)$$

$$\mathcal{E} = N\frac{d\Phi_B}{dt} \Leftrightarrow 36 = 200 \times \frac{d(BA)}{dt} \Leftrightarrow 36 = 200 \times A \times \frac{dB}{dt}$$

$$\Rightarrow \frac{dB}{dt} = 0.28 \ (T/s)$$

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4/

$0,53 * i_0 = i_0 (1 - e^{-t/\tau_L})$ (1)

$\tau_L = \frac{L}{R} = 0.02$ (s)

(1) $\Rightarrow e^{-t/0.02} = 0,47$

$\Rightarrow t = 0.0151$ (s)

5/ Mn

~~Bài tập~~ chú ý nha V_{rms} và I_{rms} là 2 giá trị chỉ có độ lớn và không giao động theo tg.

a/ $i_{rms} = \frac{\mathcal{E}_{rms}}{Z} = 0.788$ (A)

$Z = \sqrt{R^2 + (X_L - X_C)^2}$ → $X_L = \omega . L$

$X_C = \frac{1}{\omega C}$

$\omega = 2\pi f = 1000\pi$ (rad/s)

b/ $V_{rms\,RC} = V_{rms\,R} + V_{rms\,C}$

$= i_{rms} . R + i_{rms} . X_C = 40.84$ (V)

c/ ~~$P_{avg} = I_{rms}^2 R^2$~~ $P_{avg} = I_{rms}^2 . R$

~~$P_R = 0.788 \times 20^2$~~ → $P_R = 0.788^2 \times 20 = 12.42$ W

$P_C = 0.788^2 \times 31.83 = 19.76$ W

$P_L = 97.54$ W