INTERNATIONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY - HCMC

FINAL EXAMINATION – CLASS

Student Name:_____ Student ID:_____

Date: January 2018

Duration: 90 minutes

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

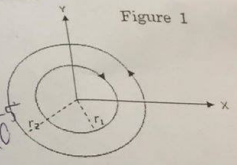
INSTRUCTIONS: This is a closed book examination. Use of cell phones, laptops and dictionaries is not allowed.

1/ (20 pts) Find the angle between a uniform magnetic field of 1.0 mT and the velocity of an electron if the magnetic force acting on the electron is 63.7×10^{-19} N and the electron has a speed of 7.0×10^{4} m/s. ($e = 1.6\times10^{-19}$ C)

2/ (20 pts) A square loop of 350 turns with a side length of 7 cm carries a current of 10 A. The loop is placed in a magnetic field of 5.0 T. Calculate the magnitude of the maximum torque exerted on the loop. ($\tau = NiAB\sin\theta$)

3/ (20 pts) Figure 1 shows two concentric wire loops of radii $r_1 = 5$ cm and $r_2 = 10$ cm that are located in the vertical *xy* plane. The inner loop carries a current of 5.0 A, and the outer loop carries a current of 12.0 A with the directions as shown in the figure. Find the magnitude and the direction of the net magnetic field at the center. ($B = \frac{\mu_0 i}{2R}; \mu_0 = 4\pi\times10^{-7}$ T.m/A)

Figure 1



4/ (20 pts) A circular coil has 100 turns of diameter of 16 cm with a total resistance of 10 Ω. The plane of the coil is perpendicular to a uniform magnetic field. At what rate should the magnetic field change for the power dissipated in the coil to be 1.2 W?

5/ (20 pts) An inductor with inductance 6.2 μH is connected in series with a 1.25 kΩ resistor.

(a) If a 12.0 V battery is inserted in the circuit, how long will it take for the current through the resistor to reach 75.0% of its final value?

(b) Find the current through the resistor at time $t = 1.0\ \tau_L$. ($\tau_L = \frac{L}{R}; i = \frac{\varepsilon}{R}\left(1 - e^{-t/\tau_L}\right)$)

END OF QUESTION PAPER

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seem our semester is coming to the end.

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$|F_b| = |q|vB\sin\theta \Leftrightarrow \theta = \sin^{-1}\left(\frac{|F_b|}{|q|vB}\right) = 34.66^0$

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$\tau = N_i AB\sin\theta \Rightarrow$ Maximum $\Rightarrow \tau = N_i AB$

$= 350 \times 10 \times 0.07^2 \times 5$

$= 85.75\ (J)$

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$\vec{B}_{s1}$ created by the smaller circle is pointing in into the page

$\vec{B}_{s2}$ // bigger circle // out of the page

$B_{net} = B_s - B_b = \frac{\mu_0 \cdot i_1 \cdot 2\pi}{4\pi \cdot 0.05} - \frac{\mu_0 \cdot i_2 \cdot 2\pi}{4\pi \cdot 0.1} = -1.25 \times 10^{-5}$ (T)

↳ $\vec{B}_{net}$: + Magnitude : $|\vec{B}| = 1.25 \times 10^{-5}$ T

+ Direction : out of the page

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$P = I^2 R \Leftrightarrow 1.2 = I^2 \times 10 \Leftrightarrow I = 0.35\ (A)$

↳ $\mathcal{E} = IR = 3.5\ (V)$

$\mathcal{E} = N\frac{d\Phi_B}{dt} = 100 \times dA \times \frac{dB}{dt} = 100 \times \pi 0.08^2 \times \frac{dB}{dt}$

↳ $\frac{dB}{dt} = 0.174\ (T/s)$

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5/

a/ $i = \frac{\mathcal{E}}{R}(1 - e^{-t/\tau_L})$; $\tau_L = \frac{L}{R} = 4.96 \times 10^{-9}\ (s)$

$0.75 = (1 - e^{-t/\tau_L})$ (Because $\frac{\mathcal{E}}{R} = ig$ and $i = 0.75\ ig$)

$\Leftrightarrow e^{-t/\tau_L} = 0.25$

$\Leftrightarrow t = 6.876 \times 10^{-9}\ (s)$

b/

$i = \frac{\mathcal{E}}{R}(1 - e^{-0.1/\tau_L})$

~~$\Leftrightarrow i = \frac{12}{1.25 \times 10^3}(1 - e^{-0.1/\tau_L})$ (6.4 A)~~

$i = \frac{12}{1.25 \times 10^3}\left(1 - e^{-\tau_L/\tau_L}\right) = 6.068 \times 10^{-3}\ (A)$