PRINCE SULTAN UNVIERSITY

Department of Mathematics and General Sciences

Physics II (PHY205)

Second Major Exam

Term 171

Monday 11/12/2017

Name:	
Student ID #:	
Section # or time:	

Instructions:

1. Examination time: **1 hour**.
2. Write your name before starting with the questions.
3. **Switch off your mobile phone** and put any books and notes away.
4. Check that you have **5 pages** in total.
5. You may use a calculator but you may not borrow one.

Constants

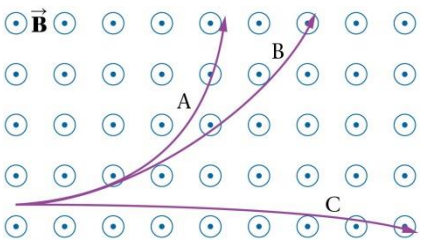
Elementary charge	$e = 1.6 \times 10^{-19}$ C
Electron mass	$m_e = 9.11 \times 10^{-31}$ kg
Proton mass	$m_p = 1.67 \times 10^{-27}$ kg
Coulomb constant	$k = 9 \times 10^{9}$ N.m^2/C^2
Permittivity of free space	$\varepsilon_0 = \frac{1}{4\pi k} = 8.85 \times 10^{-12}$ C^2/N.m^2
Permeability of free space	$\mu_0 = 4\pi \times 10^{-7}$ T.m/A

Mark

Part 1 (7 points):

Indicate the answer choice that best completes the statement or answers the question

Q1. Three charged particles enter a uniform magnetic field and move as indicated. If the particles have identical masses and speeds, which of the following statements is correct?



a) $|q_A| > |q_B| > |q_C|$, q_A and q_B are positive while q_C is negative
b) $|q_A| > |q_B| > |q_C|$, q_A and q_B are negative while q_C is positive
c) $|q_A| < |q_B| < |q_C|$, q_A and q_B are positive while q_C is negative
d) $|q_A| < |q_B| < |q_C|$, q_A and q_B are negative while q_C is positive

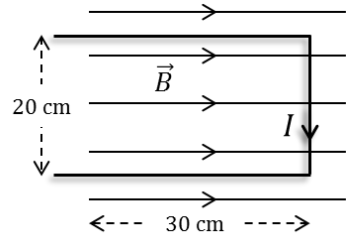
Q2. The time constant for an RC circuit is 20 seconds. In a charging circuit, what is the time required for the current to drop to 10% of its initial value?

a) 2.1 seconds
b) 58.6 seconds
c) 46.1 seconds
d) 38.0 seconds

Q3. The primary coil of a transformer has 150 turns and its secondary coil has 450 turns. If the current in the primary coil is 6 A, what is the current in the secondary coil?

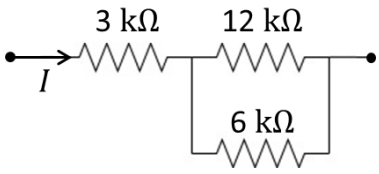
a) 2 A
b) 3 A
c) 9 A
d) 18 A

Q4. The shown current carrying wire (I = 6 A clockwise) enters in a region of constant magnetic field of 2 T pointing in the indicated direction. What is the net magnetic force on the wire?



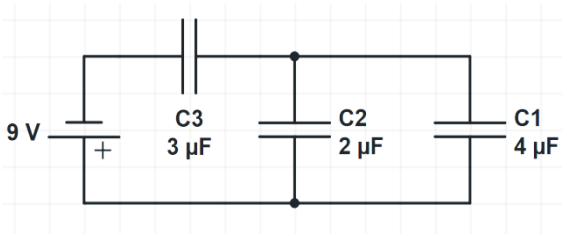
a) 9.6 N
b) 7.2 N
c) 72 N
d) 2.4 N

Q5. If the potential difference across the 6 kΩ resistance is 3 V, what is the magnitude of the current I through the 3 kΩ resistance?



a) 0.25 mA
b) 0.50 mA
c) 0.75 mA
d) 1.0 mA

Q6. In the figure, what is the equivalent capacitance of the three capacitors?



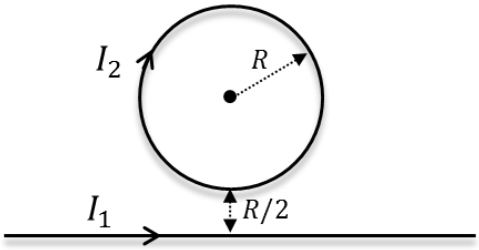
a) 2.0 μF
b) 0.5 μF
c) 1.0 μF
d) 3.0 μF

Q7. In the previous question, what is the potential difference across C_3?

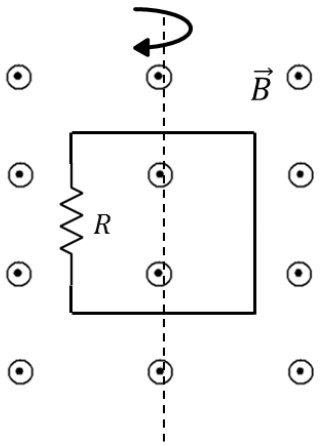
a) 3 V
b) 6 V
c) 9 V
d) 12 V

Part 2 (8 points): Solve the following 3 problems in the provided space.

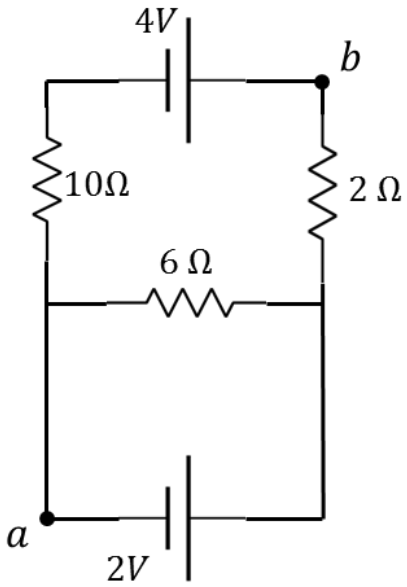
Q1. (3 points) Find the magnitude and direction of the net magnetic field at the center of the loop shown in the figure, given that $I_1 = 3$ A, $I_2 = 2$ A, and $R = 10$ cm.



Q2. (2 points) A square loop of wire of side length 10 cm located in the xy-plane is placed in a magnetic filed pointing in the $\hat{z}$ direction. The resistance of the loop is $R = 2\Omega$. If the magnetic field is decreased from 2.5 T to 0.1 T during 0.2 seconds and at the same time the loop is rotated by 60° about the +y-axis clockwise, find the magnitude and direction of the induced current in the loop during that time.



Q3. (3 points) Find the currents in the shown circuit.



Scratch sheet

Name: