



### COURSE DETAILS:

| PHYSICS II    | PHY205                     | MAJOR EXAM II |
|---------------|----------------------------|---------------|
| Semester:     | Spring Semester --Term 172 |               |
| Date:         | Monday, April 16, 2018     |               |
| Time Allowed: | 60 minutes                 |               |

### STUDENT DETAILS:

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| Student Name:      |                                                                                         |
| Student ID Number: |                                                                                         |
| Section:           | Circle your section:<br>192 (8-9 Sun, Tue, Thu), 186 (9-10 Sun, Tue, Thu), 189 (1-2:15) |
| Instructor's Name: | Circle the name of your Instructor:<br>Dr. Muaffaq Nofal, Dr. Hazem Abu-Farsakh         |

### INSTRUCTIONS:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.</li> <li>NO talking or looking around during the examination.</li> <li>NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.</li> <li>Show all your work and be organized.</li> <li>You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.</li> </ul> |
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### GRADING:

|           | Page 1 | Page 2 | Page 3 | Page 4 | Total |  |
|-----------|--------|--------|--------|--------|-------|--|
| Questions |        |        |        |        |       |  |
| Marks     | 3      | 6      | 3      | 3      | 15    |  |

**Part 1: 6 Multiple Choice Questions (0.5 mark each)**

1- Kirchhoff's current rule results from:

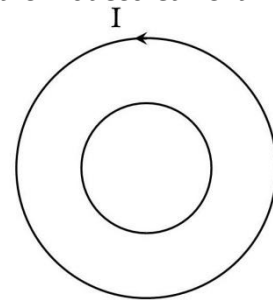
- a) The law of conservation of momentum.
- b) The law of conservation of mass.
- c) The law of conservation of charge.
- d) The law of conservation of energy.

2- The magnetic force on an electric charge is zero if

- a) The charge is not moving.
- b) The charge is moving opposite to the direction of the magnetic field.
- c) The charge is moving in the direction of the magnetic field.
- d) all of the above.

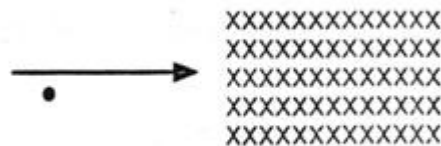
3- The diagram shows two circular coils placed in the same plane. The larger coil has a decreasing current flowing in counterclockwise direction. What is the direction of the induced current in the smaller coil?

- a) Clockwise.
- b) Counterclockwise.
- c) No induced current will be generated.
- d) Not enough information.



4- The figure shows an electron moving to the right enters a magnetic field directed into the page. What will be the direction of the magnetic force on the electron?

- a) Up.
- b) Down.
- c) Right.
- d) Left.



5- A proton and an electron moving with the same velocity enter a uniform magnetic field directed perpendicular to their velocity. As a result both will follow a circular path. Which of them will move with larger radius?

- a) The Proton.
- b) The electron.
- c) Both will move with the same radius.
- d) Both will continue moving in a straight line.

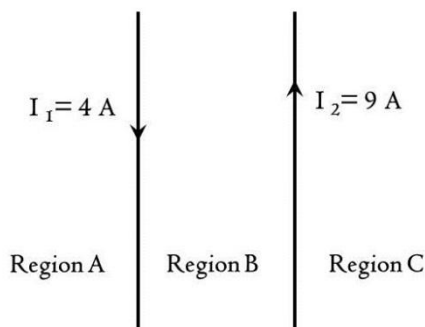
6- Which of the following is the unit of the magnetic flux?

- a) Tesla
- b) Gauss
- c) Weber
- d) Watt

## Part 2: 6 Multiple Choice Questions (1 mark each)

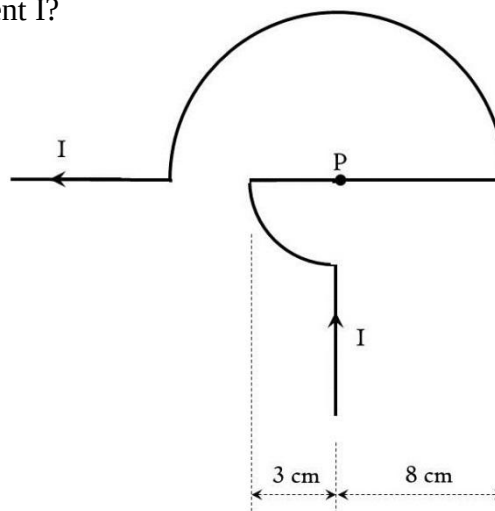
1- Two long straight wires are parallel and carry current in opposite directions. The currents in the wires are 4 A and 9 A as shown. The region in which there are points of zero net magnetic field is:

- a) Region A
- b) Region B
- c) Region C
- d) Both regions A and C



2- A current  $I$  is flowing in a wire shaped as shown, If the net magnetic field at point P is  $3.93 \times 10^{-6}$  T directed into the page, what is the value of the current  $I$ ?

- a) 8 A
- b) 3 A
- c) 20 A
- d) 6 A



3- A  $60 \mu\text{F}$  capacitor is connected in series to an  $80 \text{ k}\Omega$  resistor through a battery of 400 volts. If the capacitor is initially uncharged and the circuit is closed at  $t=0$ , how long does it take the current in the circuit to drop to 1.5 mA?

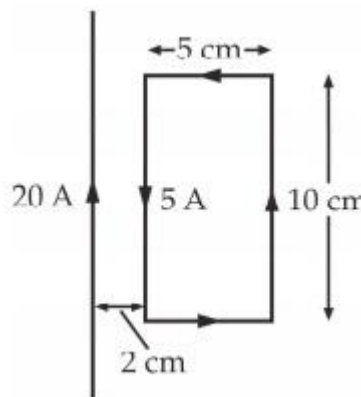
- a) 10.31 s
- b) 3.56 s
- c) 5.78 s
- d) 6.22 s

4- The maximum current in a series RC circuit is 0.3 mA and the maximum charge on the plates of the capacitor is  $120 \mu\text{C}$ . What is the time constant of that circuit?

- a) 2.5 s
- b) 0.25 s
- c) 0.4 s
- d) 40 s

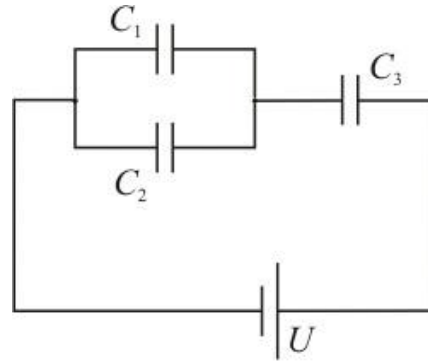
5- A long straight wire carries a current of 20 A, as shown in the figure. A rectangular coil with 2 sides parallel to the straight wire has sides 5 cm and 10 cm with the near side at a distance 2 cm from the wire. The coil carries a current of 5 A in the direction shown. What is the net force on the coil?

- a)  $7.14 \times 10^{-5}$  N to the right
- b)  $7.14 \times 10^{-5}$  N to the left
- c)  $1.29 \times 10^{-4}$  N to the right
- d)  $1.29 \times 10^{-4}$  N to the left



6- In the shown figure,  $C_1 = 30 \mu\text{f}$ ,  $C_2 = 15 \mu\text{f}$ ,  $C_3 = 40 \mu\text{f}$ . If the charge on  $C_2$  is  $13 \mu\text{C}$ , what is the charge on  $C_3$ ?

- a)  $4.33 \mu\text{C}$
- b)  $17 \mu\text{C}$
- c)  $26 \mu\text{C}$
- d)  $39 \mu\text{C}$



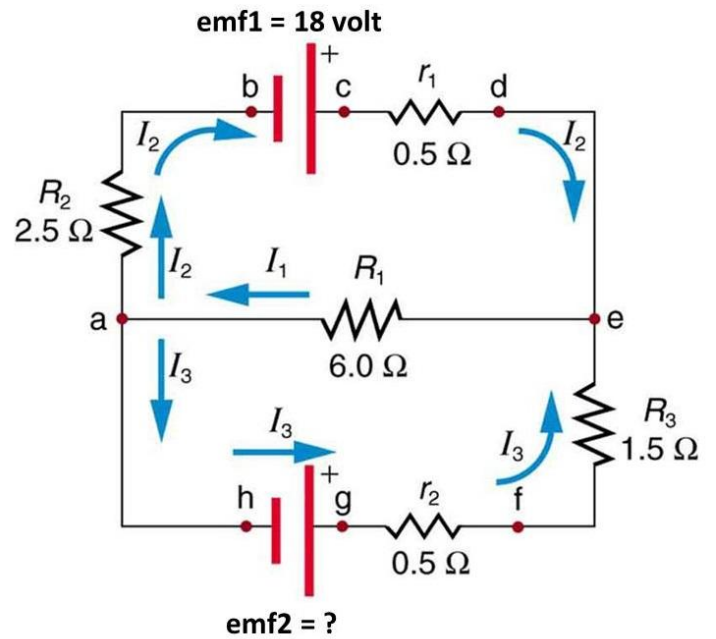
**Part 2: Solve the following two problems in the space provided in between showing all your steps (3 marks each)**

**Problem 2:** A plane circular coil of radius  $40 \text{ cm}$  of a conducting wire of resistance  $15 \Omega$  consists of  $180$  turns. The coil is placed in a uniform magnetic field of  $7 \text{ T}$  that makes an angle of  $30^\circ$  with respect to the normal direction to the coil. The magnetic field strength is decreased at a constant rate from  $7 \text{ T}$  to  $2 \text{ T}$  in a time interval of  $4 \text{ s}$ . During the same time interval the coil is rotated to increase the angle between the field and the normal to  $80^\circ$ .

a)(2 marks) Calculate the emf generated in the coil.

b)(1 mark) Calculate the induced current that flows in the coil.

**Problem 1:** If the current  $I_1$  in the shown circuit is 4.75 A, find each of the following  
a) (1 mark) The currents  $I_2$  and  $I_3$ .



b) (1 mark) The unknown  $\text{emf}_2$ .

c) (1 mark) The potential difference between points b and f.

### Scratch paper

#### CONSTANTS:

$$k=9\times 10^9 \frac{N.m^2}{C^2} , \quad \epsilon_o=8.85\times 10^{-12} \frac{C^2}{N.m^2} , \quad \mu_o=4\pi\times 10^{-7} \frac{T.m}{A}$$

$$\text{Proton mass}=1.67\times 10^{-27} kg , \text{ Electron mass } =9.11\times 10^{-31} kg$$

$$e=1.6\times 10^{-19} C$$

$$m(mili)=10^{-3} , \mu(micro)=10^{-6} , n(nano)=10^{-9} , p(pico)=10^{-12}$$