Prince Sultan University

Department of Mathematics & Physics

PHY 205- General Physics 2

Second Exam

First Semester, Term 142

Saturday 25/4/2015

Examination Time: 1 hour.

Name ----------**Section/Class time**----------

Student I.D. ---------- **Instructor.** ----------

CONSTANTS:

$$k = 9\times10^{9}\,\frac{N.m^2}{C^2}\ ,\quad \varepsilon_o = 8.85\times10^{-12}\,\frac{C^2}{N.m^2}\ ,\quad \mu_o = 4\pi\times10^{-7}\,\frac{T.m}{A}$$

Velocity of light = c= 3 x 10^8 m/s

Proton mass = 1.67x10^{-27} kg, Proton charge = 1.6x10^{-19} C

Electron mass = 9.1x10^{-31} kg, Electron charge = - 1.6x10^{-19}C

$q(t) = q_o\,(1 - e^{-t/RC})$; $I(t) = I_o\, e^{-t/RC}$; $B = \mu_o\, n\, I$

Important Instructions:

1. *You can use a scientific calculator that does not have programming or graphing capabilities.*
2. *You may **NOT** borrow a **calculator** from anyone.*
3. *Do not use **RED pen**.*
4. *This is a closed books and notes exam. Do **NOT** use notes or textbooks.*
5. *There should be **NO** talking during the examination.*
6. *Your will be **expelled** immediately from the exam if your mobile phone is seen or heard.*
7. *Any signs of **cheating** may cause you being expelled from the exam.*
8. *This examination has **2 parts**.*

Part 1** has **7 multiple choice** questions, each question worth **1 point**. **Part 2** has **two** workout problems that worth a sum of **8 points.

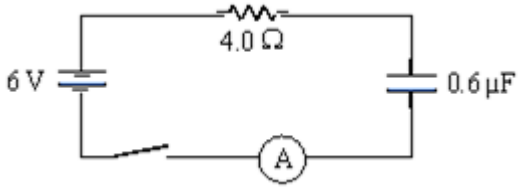
Make sure your paper has all the questions and problems.

Part 1: 5 Multiple Choice Questions (1 mark each)

1-In charging a RC series circuit where $\mathcal{E} = 10$ V, $R = 5\ \Omega$ and $C = 0.6\ \mu F$, what happens to the current, during one time constant?

a) It increases from zero to 0.74 A
b) It decreases from 2 A to 0.74 A
c) It increases from zero to 1.26 A
d) It decreases from 2 A to 1.26 A

2- A RC series circuit contains a 6.0-V battery, a 4.0 Ohm resistor, a 0.60-μF capacitor, an ammeter, and a switch all in series. What will be the current reading immediately after the switch is closed?



a) 0.55 A b) 1.5 A c) 2.0 A d) zero

3- At what angle, the force on a charged particle moving with velocity 'v' is maximum in a magnetic field?

a) 0^o b) 45^o c) 90^o d) 150^o

4- Two long parallel wires 20 cm apart are carrying currents of 10 A and 20 A in opposite directions. What is the magnitude of the magnetic field halfway between the wires?

a) 1.5 x10^{-5} T b) 6 x 10^{-5} T c) 3.6 x10^{-5} T d) 12 x10^{-5} T

5- A proton is released such that its initial velocity is from right to left across this page. The proton's path, however, is deflected in a direction toward the bottom edge of the page due to the presence of a uniform magnetic field. What is the direction of this field?

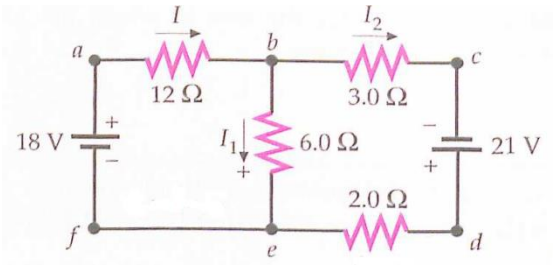
a. out of the page
b. into the page
c. from bottom edge to top edge of the page
d. from right to left across the page

Part 2: Solve the following two problems in the space provided in between showing all your steps

Problem 1 (4 marks):

Q1. Consider the given circuit.

(a) Find currents I_1, I_2, when I = 2 A.



(b) What is power dissipated by 6 Ohm resistor?

(c) Indicate real direction of currents on circuit diagram.

Problem 2 **(3 marks):**

Q2.

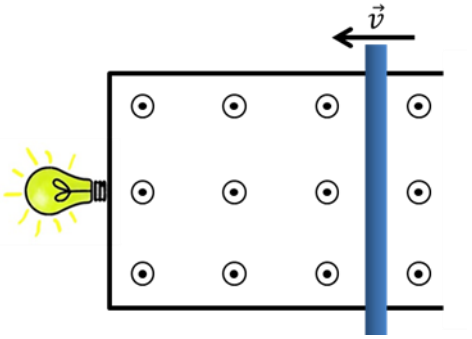
Find the magnetic field at the common center of two semi circles in figure below.

i = 50 mA; a = 6 cm; b = 10 cm.

Problem 3 **(3 marks):**

The light bulb in a circuit has a resistance of 12 ohm, and it uses 5 W of power; the rod on rails is 1.25 m long and moves to the left with a constant speed of 3.1 m/s. See figure,

(a) What is the strength of the magnetic field?



(b) What external force is required to keep the rod's constant speed?

(c) What is the direction of induced current? Show on diagram.

Scratch paper. DO NOT REMOVE