Prince Sultan University

Department of Mathematics & Physics

PHY 205- General Physics2

Second Exam

Second Semester, Term 162

Monday 1/may/2017

Examination Time: 60 minutes

Name (Please Print)_____ Student I.D. _____

CONSTANTS:

$$k = 9\times10^{9}\,\frac{N.m^2}{C^2}\ , \qquad \varepsilon_o = 8.85\times10^{-12}\,\frac{C^2}{N.m^2}\ , \quad \mu_0 = 4\pi\times10^{-7}\,\frac{T.m}{A}$$

$$\text{Electron mass} = 9.11\times10^{-31}\,kg\ ,\ \text{Electron charge} = -1.6\times10^{-19}\,C$$

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 **5 multiple choice** questions, each question worth **1 point**. **Part 2** has **two** workout problems each worth **4 points.***
Make sure your paper has all the questions and problems.

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

1- Which of the following is **NOT** true about the magnetic force on electric charges?

a) The magnetic force on electric charges at rest is zero.

b) The magnetic force is always directed perpendicular to the direction of the charge's velocity.

c) The magnetic force is maximum for charges moving parallel to the magnetic field.

d) The work done by the magnetic force on electric charges is always zero.

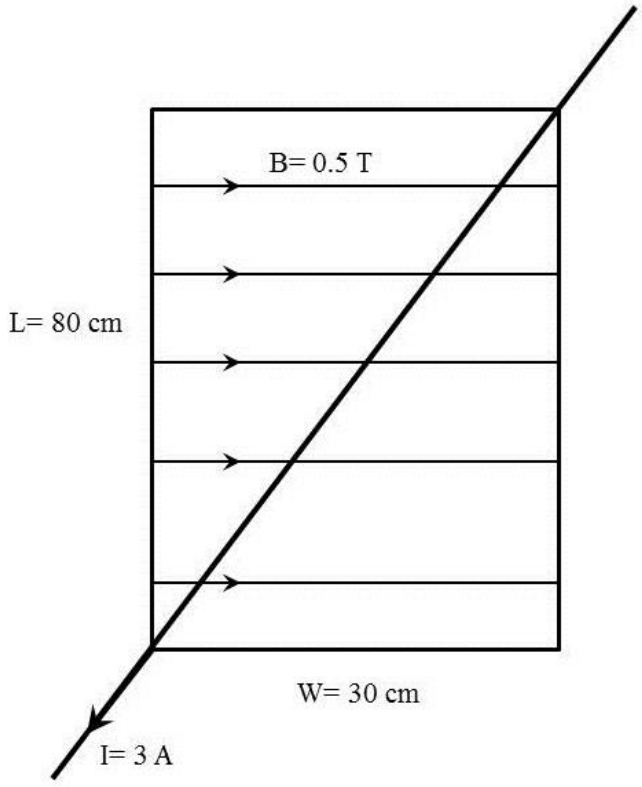
2- A magnetic field of 0.5 T directed to the right exists inside the shown rectangular area of length 80 cm and width 30 cm. Calculate the magnitude and direction of the magnetic force on a current carrying conductor that lies along the diagonal of the rectangular area. The current in the conductor is 3 A directed as indicated in the figure.

a) 1.2 N into the page.

b) 1.2 N out of the page.

c) 0.45 N into the page.

d) 0.45 out of the page.



3- A particle of mass 0.15 g and charge 70 μC is moving at a speed 21 m/s. It is desired to use a magnetic field to bend the particle into a circle of radius 9 m. What is the magnitude of the required magnetic field?

a) 5 T b) 10 T c) 7.5 m d) 2.5 T

4- An electron enters a magnetic field of 1.5 T directed into the page. Upon entry, in which direction should the electron be moving and with which speed if it is to experience a magnetic force of 4.8×10^{-14} N directed towards the bottom of the page?

a) 2×10^{5} m/s to the left.

b) 2×10^{5} m/s to the right.

c) 1.15×10^{-32} m/s to the left.

d) 1.15×10^{-32} m/s to the right.

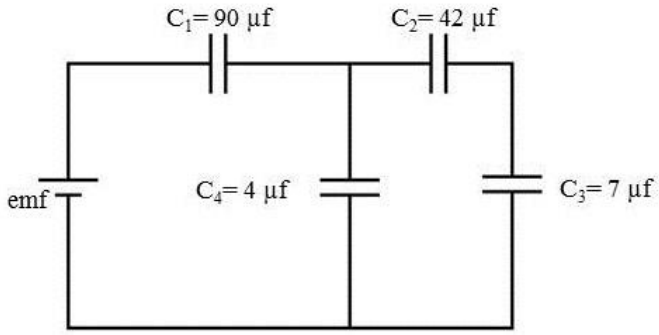
5- Two long straight current carrying conductors are parallel and 8 cm apart. The currents in the conductors are 3 A and 7 A in the same direction. What is the magnitude of the magnetic field midway between the two conductors?

a) 1.5×10^{-5} T b) 3.5×10^{-5} T c) 5.0×10^{-5} T d) 2.0×10^{-5} T

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

Problem 1 (4 marks): Consider a set of capacitors connected as shown

a) (1 mark) Calculate the equivalent capacitance of the network.



b) (3 marks) Given that the potential drop across the plates of C_3 is 48.6 volts, calculate the emf of the battery.

Problem 2(4 marks):

A 150 μf capacitor initially uncharged is connected in series to a 30 kΩ resistor thorough a battery of 60 volts. If the circuit is closed at t=0,

a) (1 mark) Find the time constant of this circuit.

b) (1 mark) Find the current through the resistor at $t = 4$ s.

c) (1 mark) Find the charge carried by the capacitor at $t = 7$ s.

b) (1 mark) How long time is needed for the current to drop to 25% of its maximum value?

Scratch paper