Prince Sultan University
Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Physics II	**PHY205**	**MAJOR EXAM II**
Semester:	Fall Semester --Term 181	
Date:	Sunday, NOV. 25. 2018	
Time Allowed:	60 minutes	

STUDENT DETAILS:

Student Name:		
Student ID Number:		
Section:	680(8AM: S, T, TH)	544(9AM: S, T, TH):
Instructor's Name:	Dr. Asif Zaidi	

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities.
- NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

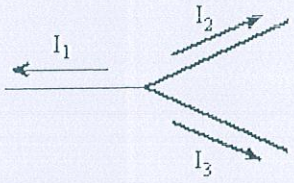
GRADING:

	Page 1	**Page 2**	**Page 3**	**Page 4**	**Total**	**Total**
Questions	1-5	1	2			
Marks	7	4	4			15

Part 1: 5- Multiple Choice Questions. (1mark each : last two questions 2marks each)

1) Electrical charges and magnetic poles have many similarities, but one difference is:
   a) Opposite magnetic poles repel.
   b) One magnetic pole cannot create magnetic poles in other materials.
   c) A magnetic pole cannot be isolated.
   d) Magnetic poles do not produce magnetic fields.

2) What is Kirchhoff's current equation for this junction?



a) $I_1 = I_2 + I_3$ b) $I_2 = I_1 + I_2$ c) $I_3 = I_1 + I_2$ d) $I_1 + I_2 + I_3 = 0$

3) Two long parallel wires 40 cm apart are carrying currents of 10A and 20A in the opposite direction. What is the magnitude of the magnetic field halfway between the wires?

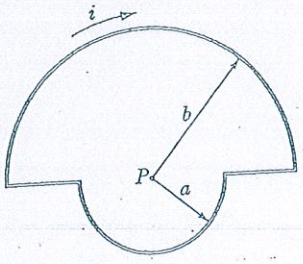
a) 10 μT b) 25 μT c) 30 μT. d) 40μT

4) Two wires with the same resistance have the same diameter but different lengths. If wire 1 has length L_1 and wire 2 has length L_2, how do L_1 and L_2 compare if wire 1 is made from copper and wire 2 is made from aluminum? The resistivity of copper is 1.7×10^{-5} Ω·m and the resistivity of aluminum is 2.82×10^{-5} Ω·m.

a) $L_1 = 0.36\ L_2$ b) $L_1 = 0.6\ L_2$ c) $L_1 = 1.7\ L_2$ d) $L_1 = 2.8\ L_2$

5) Calculate the magnitude of the magnetic field at the common center of two semi circles in figure below, where

I = 100 mA a = 2 cm b = 4 cm.



a) 0. 75 μT b) 1.23 μT c) 1.72 μT d) 2.35 μT

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

Problem 1: (4 marks)

A charged capacitor is connected to a resistor and a switch in series. The circuit has a time constant of 1.5 seconds. Soon after switch is closed, the charge on capacitor is 75% of its initial charge.

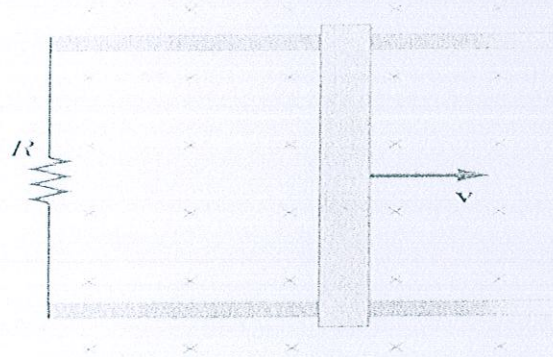
(a) What is the time required to reach this charge?

(b) Draw a circuit diagram for this problem. If R = 250 KΩ, what is the value if C?

(c) What percentage of the initial charge remains on the capacitor at four time constant?

Problem 2: (4 marks)

A sliding bar of length 50 cm moves on rails at 2 m/s towards right hand in a magnetic field of 0.25 T. If resistance R = 0.5 Ω, use concept of motional emf to find:



(a) The induced voltage?

(b) What is the induced current in the loop? Mark its direction on the diagram.

(c) what is the power dissipated by the resistor?

(d) How much force is required to keep rod in motion?

GIVEN DATA

$k = 9 \times 10^{9} \frac{N.m^2}{C^2}$, $\varepsilon_o = 8.85 \times 10^{-12} \frac{C^2}{N.m^2}$, $e = 1.6 \times 10^{-19} C$

Proton mass $= 1.67 \times 10^{-27} kg$, electron mass $= 9.1 \times 10^{-31} kg$

$q(t) = q_o (1 - e^{-t/RC})$; $I(t) = I_o e^{-t/RC}$

$\mu_o = 4\pi \times 10^{-7}$ Weber/A.m.

Scratch paper (DO NOT REMOVE)