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

COURSE DETAILS:

Physics II	PHY205	Final Examination
Semester:	Fall Semester –Term 181	
Date:	Wednesday,	Dec. 26, 2018
Time Allowed:	3 hours.	

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	Page 5	Page 6	Page 7	Total
Questions	1-6MC	5MC	Q1	Q2	Q3	Q4		
Marks	6	10	6	6	6	6		40

GIVEN DATA (Do not Remove)

CONSTANTS:

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

Speed 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*

1 eV = *1.6x10^{-19}*J 1nm = 1nano meter = 10^{-9} m

Dielectric constant of Air & Vacuum = 1

Refractive index of air = 1

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

Good Luck

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

1- A metallic object holds a charge of 8 μC. How many electrons this conductor has lost in charging process?

a) 42×10^{13} b) 61×10^{12} c) 5×10^{13} d) 8×10^{13}

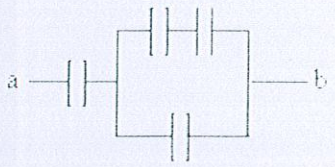
2- Two-point charges are separated by 5 cm and have charges of +4 μC and –4 μC, respectively. What is the electric potential at a point midway between the two charges?

a) 10 V b) 14 V c) 20 V d) Zero

3- A device operates at 4000V, but electrical power outlet provides only 120 V. Device can work using a transformer. A student building transformer puts 27 turns in primary coil, how many turns he should have on the secondary coil?

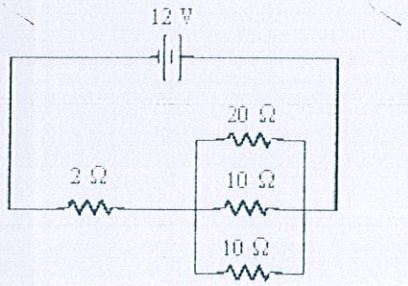
a) 270 b) 500 c) 900 d) 950

4- How much charge following system will store if 10 V is applied between points "a" and "b". See figure. All capacitors are 1.0 μF



a) 6 μC b) 5 μC c) 3 μC d) 2 μC

5-How much power is being dissipated by this circuit?



a) 2 W b) 10 W c) 12 W d) 24 W

6- A light ray is incident on water at 60°. Refractive index of water is 1.33, the angle of refraction is:

a)20.9° b) 40.6° c) 60.5° d) 70°

Part 2: 5 Multiple Choice Questions (2 mark each)

1- A current of 1.82 A flows through a copper wire 175 cm long and 1.11 mm in diameter, if potential difference recorded across the length of the wire is 0.06V then resistivity of copper is:

a) 2.1×10^{-6} Ω.m b) 1.12×10^{-7} Ω.m c) 1.81×10^{-8} Ω.m d) 0.98×10^{-9} Ω.m

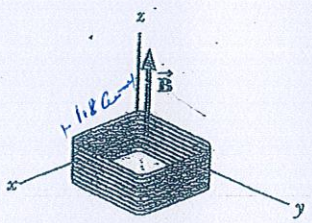
2- A series RC circuit has 5 μF capacitor and 0.8 MΩ resistor connected with a battery of 12V. Switch is closed at time t = 0 and capacitor starts charging. What will be the charge on capacitor after 6 seconds?

a) 46.6 μC b) 96.5 μC c) 125 μC d) 150 μC

3- A deuteron, with the same charge as proton but twice the mass of a proton, moves with a speed of 3.0×10^5 m/s perpendicular to a uniform magnetic field of 0.20 T. Which of the paths described below would it follow?

a) A straight line path
b) A circular path of 1.6 cm radius
c) A circular path of 3.1 cm radius
d) A circular path of 0.78 cm radius

4- A coil has 25 turns of wire see figure. An applied magnetic field perpendicular to coil changes from 0 to 0.5 T. If total resistance of this coil is 0.35 Ω, induced current in the coil is: $\ell = 1.8$ Cm



a) 0.14 mA b) 0.51mA c) 1 mA d) 1.53 mA

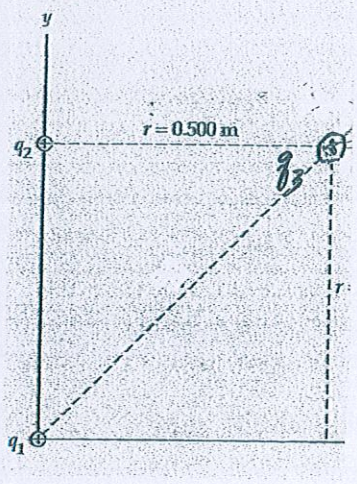
5- Two wires, each having weight per unit length of 10^{-4} N/m, are parallel with one directly above the other. The wires are 10 cm apart and are in static equilibrium if equal current flows in both wires in opposite direction. The magnitude of current in each wire should be:

a) 1.5 A b) 4.05 A c) 7.07 A d) 9.5 A

Part 3: Solve the following four problems in the space provided in between showing all your steps (6 marks each)

Question 1(6 marks):

a) Three charges, each of 2.9 μC are placed three corners of a square 50 cm on one side, as shown in figure. Find force on charge q_3.

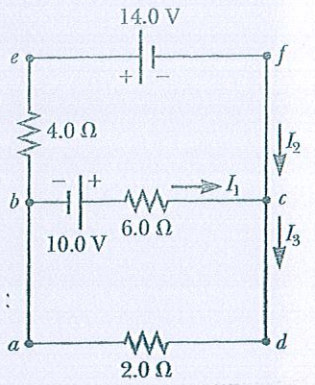


b) A positive charged particle of charge 0.52 μC is released from positive plate of a capacitor. This charge was initially at rest and has a mass of 1.75×10^{-5} kg. As this particle moves to a point 'B' electrical potential decreases to 60V. What is particle's speed at point 'B'?

(Independent of part (a))

Question 2. (6 marks):

a) In this given network, calculate unknown currents I_1, I_2, I_3.



b) What is the power dissipated by 6 Ω resistor?

c) Show that KCL is valid using currents in this circuit. What are real current directions? Mark real current directions on circuit diagram.

Question 3 (6 marks):

A solenoid has100 turns of wire of radius 5 cm and has a length of 10 cm. The solenoid carries a current of 500 mA.

(a) What is the magnitude of the magnetic field in the center of solenoid?

(b) What will be the kinetic energy of a proton orbiting inside solenoid in a circle of radius 2 cm in a perpendicular magnetic field of this soliniod?

(c) How much wire is needed to build this solenoid?

Question 4 (6 marks):

Two converging lenses, each of focal length 15 cm, are placed 40 cm apart. The object of height 2 cm is placed 30 cm in front of the first lens. Both lenses have same optic axis.

(a) What is the location and nature of the image formed by the first lens?

(b) What is the location and nature of the image formed by the second lens?

(c) What is the nature, magnification of the final image?

(d) What is the size of the final image?

Scratch paper. Do not Remove.