Prince Sultan University

*Department of Mathematics & Physics*

***PHY 205- General Physics 2***

***First Major Test***

First Semester, Term 142

Monday 9/3/2015

**Examination Time : 60 minutes**

**Name:** ----------

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

**CONSTANTS:**

$$k = 9\times10^{9}\,\frac{N.m^2}{C^2}\ ,\quad \varepsilon_o = 8.85\times10^{-12}\,\frac{C^2}{N.m^2}\ ,\quad e = 1.6\times10^{-19}C$$

$$\text{Proton mass} = 1.67\times10^{-27}\,kg\ ,\quad \text{electron mass} = 9.1\times10^{-31}\,kg$$

***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 each problem worth 4 **points.***

*Make sure your paper has all the questions and problems.*

**Part 1: 7- Multiple Choice Questions (1 mark each)**

1) If distance between the two charges is decreased by 2 times then new force 'F' between charges will be:

a) 1/2 F b) 1/4 F c) 2 F d) 4 F

2) An electron (charge $-1.6 \times 10^{-19}$ C) moves on a path perpendicular to the direction of a uniform electric field of strength 3.0 N/C. How much work is done on the electron by the electric field as it moves 15 cm?

a) $4.8 \times 10^{-20}$ J b) $-4.8 \times 10^{-20}$ J c) $1.6 \times 10^{-20}$ J d) zero

3) How many charges flow per second if current through a conductor is 16 mA?

a) $10^4$ b) $10^{12}$ c) $10^{14}$ d) $10^{17}$

4) Two charges of +5 nC & -5 nC are placed along x-axis 50 cm apart. What is the magnitude of the electric potential energy due to these charges?

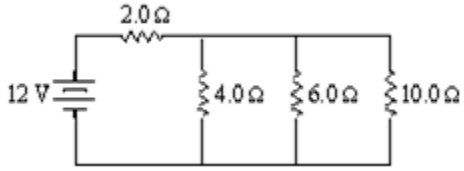
a) - 450 J b) $-4.5 \times 10^{-7}$ J c) $-1.8 \times 10^{-6}$ J d) None of these.

5) A 9.0-V battery is connected between two parallel metal plates 4.0 mm apart. What is the magnitude of the electric field between the plates?

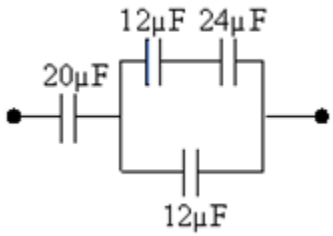
a) $2.3 \times 10^3$ N/C b) 9.0 N/C c) $4.5 \times 10^3$ N/C d) None of these.

6) What is the current in 10 Ohm resistor in circuit below?

a) 0.59 A b) 1 A c) 2.5 A d) 10 A




7) Total energy stored by the system of capacitors in diagram when 10 V is applied is;



a) 100 J (b) 300 J (c) 500 J (d) None of these

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

**Problem 1:** (5 marks)

(a) Find Force on charge $q_3$ such as charges form isosceles triangle. $q_3$ is on y-axis, while other charges on x- axis.
$q_1 = q_2 = 5$ nC ; $q_3 = 2$ nC & a = 30 cm.

(b) Find electric potential due to charges $q_1 = q_2 = 5$ nC at point 'p' corresponding to part 'a' by removing $q_3$. a = 30 cm. Charges and point form isosceles triangle while point 'p' is on y-axis.

**Problem 2:** (3 marks)

A proton has initial speed of $4 \times 10^5$ m/s, when it enters a long tube. Positive potential can be applied at the other end of this tube to stop fast moving proton.

(a) What potential difference is required to bring proton to rest?

(b) What potential difference is needed to apply to reduce its kinetic energy to half of its initial value?

Scratch paper (DO NOT REMOVE)