 <b>Catholic University Institute of the Diocese of Buea</b> <b>2018/2019 ACADEMIC YEAR</b> <b>First Semester Examination – February 2019</b>			
School	<b>ENGINEERING</b>		Department
Course Code	<b>PHY 101</b>	Course Title	<b>Electrical and Computer</b>
Status	<b>C</b>	Credit Value	<b>Physics for Engineers</b>
Date	<b>26/02/2019</b>	Venue	<b>4</b>
Course Master	<b>Mr. EKANG Rene</b>		
		Time	<b>11:30 – 14:30</b>

**LEVEL: FRESHMAN**

**DURATION: 3 Hours**

**Instructions: Answer ALL QUESTIONS**

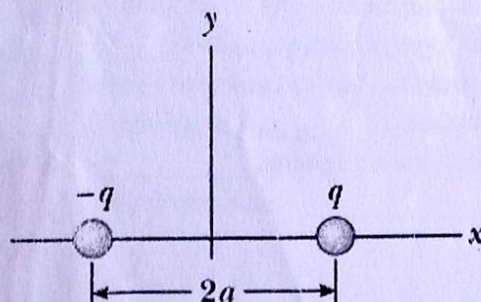
**Materials Allowed: Scientific Calculator**

**Exercise 1: (18 points)**

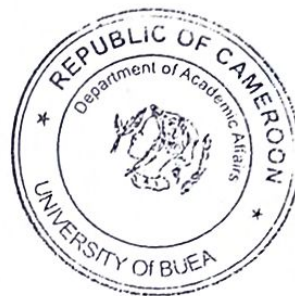
1. Present in detail the myth generated between the idea of <Action at a distance> and the <Field Theory Concept> between objects, and list the attributes of each idea, and the conclusion. **(6 marks)**
2. Explain the difference between load resistance in a circuit and internal resistance in a battery. **(2 marks)**
3. Give the difference between magnetic flux and magnetic field? **(4 marks)**
4. What is the fundamental source of Electromagnetic radiation? **(2 marks)**
5. Use Gauss' law to explain why electric field lines must begin or end electric charges. **(4 marks)**

**Exercise 2: (6 marks)**

Consider the electric dipole shown in the figure below. Show that the electric field at a distant point on the  $+x - axis$  is  $E_x \approx \frac{4k_e qa}{x^3}$ . **(6 marks)**







**Exercise 3 (6 marks)**

Consider an infinite number of identical charges (each of charge  $q$ ) placed along the  $x$  - axis at distances  $a, 2a, 3a, 4a, \dots$  from the origin. What is the electric field at the origin due to this distribution? 6 marks

Hint: Use the fact that:  $1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots = \frac{\pi^2}{6}$

**Exercise 4 (6 marks)**

A battery has terminal voltage  $V_t = 10.0V$ . The internal resistance  $r = 0.20\Omega$ . A load of  $R = 5.60\Omega$  is connected to its terminals.

- What is the current through the load? (3 marks)
- What is the emf of the battery? (3 marks)

**Exercise 5: (6 marks)**

An electric current is given by the expression:

$I(t) = 100 \sin(120\pi t)$  where  $I$  is in amperes and  $t$  in seconds. What is the total charge carried by the current from  $t = 0$  to  $t = \frac{1}{240}$  s. (6 marks)

**Exercise 6: (6 marks)**

At a certain distance from a point charge, the magnitude of the electric field is  $500V/m$  and the electric potential is  $-3.00kV$ .

- What is the distance to the charge? (3 marks)
- What is the magnitude of the charge? (3 marks)

**Exercise 7: (10 marks)**

- If a drop of liquid has capacitance  $1.00pF$ . What is its radius? (4 marks)
- If another drop has radius  $2.00mm$ , what is its capacitance? (3 marks)
- What is the charge on the smaller drop if its potential is  $100V$ . (3 marks)