

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF CERTIFICATE IN COMPUTER SCIENCE

PHYS 00141: INTRODUCTION TO ELECTRICITY AND MAGNETISM

STREAMS: CERT (COMPUTER SCIENCE)

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 5/12/2018

11.30 A.M - 1.30 P.M.

INSTRUCTIONS:

- Answer question ONE and any other TWO questions
- Use of calculator and mathematical tables allowed.
- Take $e = 1.6 \times 10^{-19}C$
 $C = 3.0 \times 10^8m/s$
 $K = 9.0 \times 10^9Nm^2C^{-2}$

QUESTION ONE: [30 MARKS] - COMPULSORY

- (a) Distinguish between electrical potential energy and electric potential stating their SI units. [6 Marks]
- (b) State the two Kirchoff laws of electrostatics and write their mathematical expression. [6 Marks]
- (c) What are electric field lines? Draw the electric field of (i) a positive charge, (ii) a negative charge and (iii) a dipole. [4 Marks]
- (d) State the two laws of electrostatics. [3 Marks]
- (e) State the Flemings' left and right hand rules clearly indicating where they are used. [4 Marks]
- (f) What is an electromagnet? [1 Mark]
- (g) Distinguish between the two fundamental charges. [2 Marks]
- (h) Give two differences between alternating current and direct current. [2 Marks]

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- (i) What is the main advantage of a secondary voltage source over a primary source?

[2 Marks]

QUESTION TWO: [20 MARKS]

- (a) Differentiate between an electromagnet and a magnet and give an example of a device that uses each of them. [6 Marks]
- (b) A computer motherboard has resistance of 12Ω and is operated by four 1.5 V batteries connected in series
- (i) What current does the device draw
- (ii) What is the power consumed by the device [3 Marks]
- c. Discuss two factors that determine the resistance of a conductor and show how they are related. [5 Marks]
- d. Define the following terms; electrostatic force and electromotive force. [4 Marks]

QUESTION THREE: [20 MARKS]

- (a) A 2KW electric fire is used for 10 hours per week and a 100W is used for 10 hours each day. Find the total energy consumed each week and the cost per week if 1KWh of electricity costs sh 10. [10 Marks]
- (b) If a wire of resistance 30Ω is uniformly stretched until its diameter is halved, what would be its new resistance be, assuming no change in resistivity occurs? [6 Marks]
- (c) Distinguish between motor and dynamo rules. [4 Marks]

QUESTION FOUR: [20 MARKS]

- (a) What is the maximum and minimum equivalent capacitances that can be obtained by combinations of 3 capacitors of $1.5\mu\text{F}$, $2\mu\text{F}$ and $3\mu\text{F}$? [10 Marks]
- (b) Discuss four data/information storage devices. [10 Marks]

QUESTION FIVE: [20 MARKS]

Three identical point charges, each of mass $m = 0.100 \text{ kg}$, hang from three strings, as shown in the Figure below. If the lengths of the left and right strings are each $L = 30.0 \text{ cm}$, and if the angle θ is 45.0° , determine the value of q .

