

PHYS 00141

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS
CHUKA/EMBU

EXAMINATION FOR THE AWARD OF CERTIFICATE IN COMPUTER SCIENCE

PHYS 00141: INTRODUCTION TO ELECTRICITY AND MAGNETISM

STREAMS: CERT COMP SCI

TIME: 2 HOURS

DAY/DATE: FRIDAY 12/04/2019

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 $e = 1.6 \times 10^{-19} C$

$$C = 3.0 \times 10^8 m/s$$

$$K = 9.0 \times 10^9 Nm^2 C^{-2}$$

$$\epsilon_0 = 8.85 \times 10^{-12} C^2 N^{-1} m^{-2}$$

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)

PHYS 00141

- (g) Distinguish between the two fundamental charges. (2 marks)
- (h) Give two differences between alternating current and direct current. (2 marks)
- (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)

PHYS 00141

- (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 point charges are aligned along the x -axis as shown in Figure 3 below. Find the electric field at the position $x = +2.0\text{ m}$, $y = 0$.

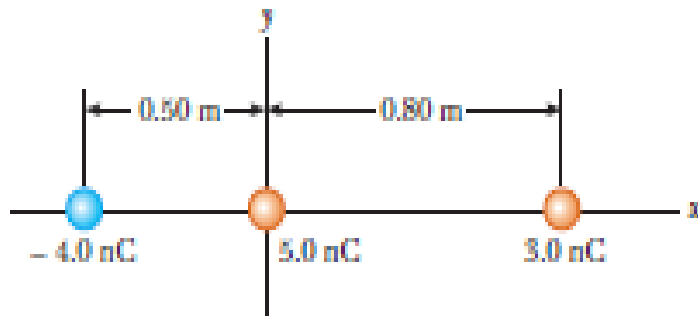


Figure 3

(20 marks)
