

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

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: MONDAY 11/12/2017

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

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

QUESTION ONE (30 marks) COMPULSORY

- (a) State and briefly explain three factors that affect the capacitance of a capacitor. (6 marks)
- (b) Differentiate between ohmic and non-ohmic conductors giving an example of each.. (3marks)
- (c) Differentiate between gravitational and elastic potential energy giving an equation for each. (4 marks)
- (d) State the two laws of electrostatics. (2 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)
- (i) List four precautionary/safety measures used in electricity supply. (2 marks)
- (j) State what a diode is, draw its circuit symbol and give two of its applications.(4 marks)

QUESTION TWO (20 marks)

a. What is electromagnetic induction? Hence distinguish between self and mutual induction giving an application of each of them. (9 marks)

b. Differentiate between an electromagnet and a magnet and give an example of a device that uses each of them. (6 marks)

c. 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? (2 marks)
- (ii) What is the power consumed by the device (3 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 $3\mu\text{F}$? (6 marks)
- (b) Discuss four data/information storage devices. (8 marks)
- (c) What are input/output devices? List four input devices and four output devices. (6marks)

QUESTION FIVE (20 marks)

- a. A lamp ($R = 150 \Omega$), an electric heater ($R = 25 \Omega$), and a fan ($R = 50 \Omega$) are connected in parallel across a 120-V line.(i) What total current is supplied to the circuit? (ii) What is

the voltage across the fan? (iii) What is the current in the lamp? (iv) What power is expended in the heater? (10 marks)

- (a) Discuss two factors that determine the resistance of a conductor and show how they are related. (6 marks)
- (b) Define the following terms; electrostatic force and electromotive force. (4 marks)
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