

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 Y1S2

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 18/12/2024

8.30 A.M – 10.30 A.M

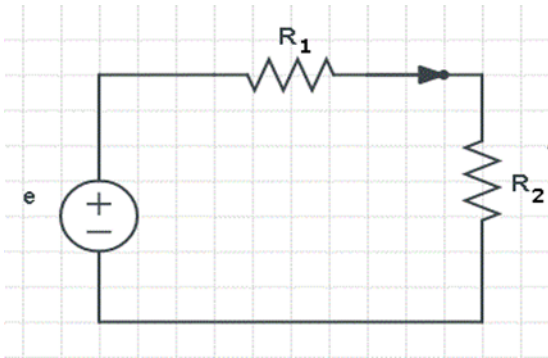
INSTRUCTIONS:

- Answer Question One in Section A and any other Two Questions in Section B
 - Do not write anything on the question paper
 - This is a closed book exam, No reference materials are allowed in the examination room
 - There will be No use of mobile phones or any other unauthorized materials
 - Write your answers legibly and use your time wisely
 - You may use the data below
- i. Take $e = 1.6 \times 10^{-19} \text{C}$
 - ii. $K = 9.0 \times 10^9 \text{Nm}^2 \text{C}^{-2}$
 - iii. $\mu_0 = 8.85 \times 10^{-12} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$

QUESTION ONE (30 MARKS)

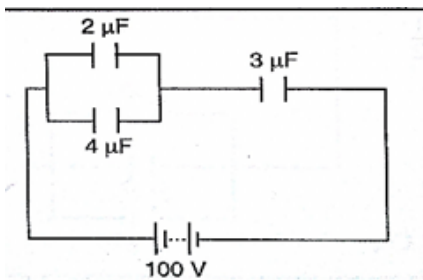
- a) State what a diode is, draw its circuit symbol and give two of its applications. (4 marks)
- b) State three methods of making magnets. (3 marks)
- c) State and briefly explain three factors that affect the capacitance of a parallel plate capacitor. (6 marks)
- d) Given that the resistivity of nichrome is $1.1 \times 10^{-6} \Omega \text{m}$, what length of nichrome wire of diameter 0.42 mm is needed to make a resistance of 20Ω ? (4 marks)
- e) State ohms law giving its mathematical equation. (3 marks)
- f) Define an electric current (1 mark)
- g) State Fleming's left-hand rule. (2 marks)

- h) Differentiate between ohmic and non-ohmic conductors giving an example of each. (3marks)
- i) In the circuit below resistors R1 and R2 are in series and have resistances of $5\ \Omega$ and $10\ \Omega$, respectively. The voltage across resistor R1 is equal to 4 V. Find the current passing through resistor R2 and the voltage across the same resistor. (4 Marks)



QUESTION 2 (20 MARKS)

- a) State what a capacitor is and draw its circuit symbol. (2marks)
- b) Three capacitors of capacitance $2\ \mu\text{F}$, $4\ \mu\text{F}$ and $3\ \mu\text{F}$ are arranged as shown



- c) Calculate for:
- i. Effective capacitance. (3marks)
 - ii. The charges on each capacitor. (6marks)
 - iii. Find the energy stored in the $3\ \mu\text{F}$ capacitor. (3marks)
- d) State and explain three applications of capacitors. (6marks)

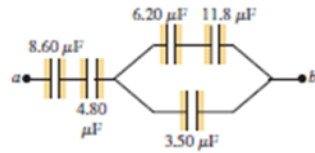
QUESTION THREE (20 MARKS)

- a) List and explain the four basic components of a computer power supply. (8marks)
- b) Define the term magnet and hence state three properties of magnets . (4marks)
- c) An 1800-W toaster, a 1.3-kW electric frying pan, and a 100-W lamp are plugged into the same 20-A, 120-V circuit.

- i. What current is drawn by each device, and what is the resistance of each device? (5 marks)
- ii. Will this combination trip the circuit breaker? Give a reason for your answer. (3marks)

QUESTION FOUR (20 MARKS)

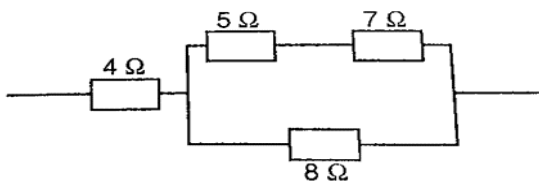
- a) A parallel-plate capacitor has capacitance of 1.0 F. If the plates are 1.0 mm apart, what is the area of the plates? (4marks)
- b) For the capacitor network shown below, the potential difference across it is 12.0 V. Find



- i. Effective capacitance. (3marks)
 - ii. The charges on each capacitor. (6marks)
 - iii. Find the energy stored in the 4.8 μF capacitor. (3marks)
- c) Define an electromagnet and give three factors affecting the strength of an electromagnet. (4marks)

QUESTION FIVE (20 MARKS)

- a) State and explain factors affecting resistance of a metallic conductor. (6marks)
- b) State the Kirchhoff's rules. (4marks)
- c) Calculate the effective resistance in the following (5 marks)



- d) An electric heater running on 240 V mains has a current of 2.5 A.
- i. What is its power rating? (3 marks)
 - ii. What is the resistance of its element? (2 marks)