

**BOWEN UNIVERSITY, IWO. OSUN STATE. NIGERIA**  
**COLLEGE OF AGRICULTURE, ENGINEERING, AND SCIENCE**  
**PHYSICS PROGRAMME**  
**SECOND SEMESTER EXAMINATION, 2022/2023 SESSION**

**PHY 202: INTRODUCTION TO ELECTRIC FIELDS AND ELECTRONICS (3 CREDITS)**

**DATE: THURSDAY, 22<sup>ND</sup> JUNE, 2023**

**TIME: 3:30 P.M – 6:30 P.M**

**INSTRUCTION: Attempt Any Four Questions**

**(Each question carries 25 marks)**

Use the following constants where applicable.

Boltzman constant =  $1.38 \times 10^{-23}$  J/K

1u (atomic mass unit) =  $1.66 \times 10^{-27}$  kg,

rest mass of proton = 1.007276u,

rest energy equivalent (1u) = 931.494 MeV/u,

charge on an electron  $e = 1.6 \times 10^{-19}$  C,

1 eV =  $1.602 \times 10^{-19}$  J,

rest mass of electron = 1.008665u

mass of electron  $m_e = 9.1 \times 10^{-31}$  kg

**QUESTION 1**

- A. (i) Explain the term "impedance" in alternate current (a.c) circuits. (5 marks)  
(ii) Discuss briefly how the magnitude of impedance is calculated using complex numbers. (5 marks)
- B. Explain the term resonance in alternate current (a.c) circuits. (9 marks)
- C. Determine the impedance of a circuit that has a resistance of 100 ohms and a capacitance of 10 microfarads at a frequency of 100 Hz in complex notation. (6 marks)

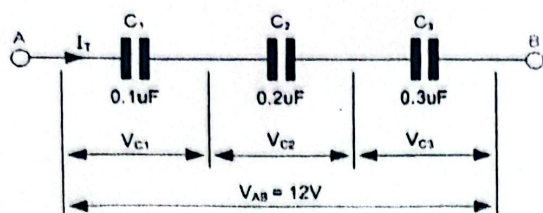
**QUESTION 2**

- A. (i) What is an inductor? (4 marks)  
(ii) Explain the concept of inductance of an inductor. (5 marks)
- B. Write short notes on the following:  
(i) Self inductance; and (4 marks)  
(ii) Mutual inductance. (4 marks)
- C. (i) Discuss briefly, the time constants of an inductor. (3 marks)  
(ii) Determine the inductance of a coil with 500 turns and an average radius of 5.0 cm if it has a length of 20 cm and a permeability of  $4\pi \times 10^{-7}$  H/m? (5 marks)

**QUESTION 3**

- A. (i) Define the term 'capacitance' of a capacitor. (3 marks)  
(ii) What is capacitive reactance? (3 marks)
- B. (i) How do you determine the value of a parallel plate capacitor? (2 marks)  
(ii) Give four (4) applications of capacitors. (8 marks)

C.



Three capacitors  $C_1 = 0.1 \mu\text{F}$ ,  $C_2 = 0.2 \mu\text{F}$  and  $C_3 = 0.3 \mu\text{F}$  are connected in series across a 12 volts battery source. Determine

- the current flowing through each of the capacitor, (2 marks)
- the voltage across each capacitor and (5 marks)
- the total current flowing through the circuit. (2 marks)

#### QUESTION 4

- What are electronic oscillators? (6 marks)
  - Differentiate between sinusoidal oscillators and relaxation oscillators (2 marks)
- Write a short note on oscillator circuit (5 marks)
  - Mention three applications of oscillators in electronics. (6 marks)
- Determine the frequency of an (inductor-capacitor) L.C oscillator, if the inductance is 45H and capacitance is  $16 \mu\text{F}$ . (6 marks)

#### QUESTION 5

- Consider figure 'x' below. Find  $I_1$ ,  $I_2$ ,  $I_3$ ,  $I_4$  and  $I_5$  and charge  $Q$  on the capacitor

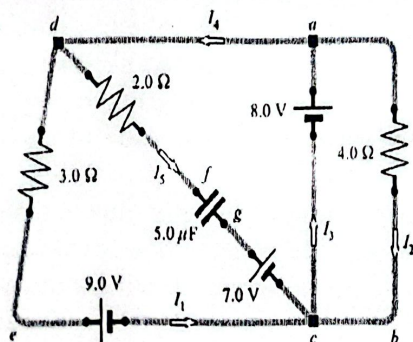


Figure x

(10 marks)

- State the two Kirchhoff's rules. (write them out also mathematically) (6 marks)
- Write short note on 'Q'-factor of an electronic system. (5 marks)
  - Define the term potential difference (2 marks)
  - When does a potential difference becomes absolute? (2 marks)

*Handwritten signature and date: 01/06/21*