UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	FUNDAMENTALS OF ELECTRIC AND ELECTRONIC
COURSE CODE	:	DAU 10203
PROGRAMME CODE	:	DAU
EXAMINATION DATE	:	JULY / AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.** 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 (a) A resistor's first three colour bands are brown, green, and yellow. State the resistance of the resistor.

(2 marks)

(b) **Figure Q1(b)** shows a series-parallel network of ten resistors connected to 30 V of voltage supply. Given the resistance of each resistor is 15 Ω. Calculate the equivalent resistance of the network.

(18 marks)

Q2 For the circuit shown in **Figure Q2(a)**,

(a) Calculate the current flow labeled as I_1, I_2, and I_3 by using Kirchhoff's Law.

(17 marks)

(b) From your answer in **Q2(a)**, draw the actual direction of the current flow for I_1, I_2, and I_3.

(3 marks)

Q3 (a) **Figure Q3(a)** shows capacitors connected to a voltage source of 36 V. Calculate:

(i) the capacitance of the equivalent capacitor.

(10 marks)

(ii) the charge stored on capacitor C4.

(8 marks)

(b) List **two (2)** function of capacitor.

(2 marks)

Q4 (a) A uniform magnetic field B, with magnitude 2.4 mT, is directed vertically upward throughout the volume of a laboratory chamber. A proton with velocity 3.2×10^7 m/s enters the chamber, moving horizontally from negative x-axis.

(i) Calculate the magnitude of magnetic force acting on the proton.

(4 marks)

(ii) From your answer in **Q4(a)(i)**, draw and state the direction of the magnetic force acting on the proton.

(4 marks)

(iii) Calculate the acceleration of the proton before it is exiting the chamber.

(4 marks)

(b) (i) From **Figure Q4(b)**, compute the resultant magnetic field at the point S due to the two wires X and Y. Given the distance between the point S to wire X and Y are 12 cm and 8 cm, respectively.

(4 marks)

(ii) If a negative charge particle is placed at point s and it moves vertically upwards with a velocity of 3 m/s, calculate the magnitude and direction of the magnetic force exerted on the particle.

(4 marks)

Q5 (a) Define Faraday's Law of Induction.

(2 marks)

(b) A circular coil is placed in a magnetic field directed 30° to the normal of the coil. The coil has 200 turns and radius of 2.8 cm. from the graph of magnetic field variation versus time as shown in **Figure Q5(b)**, determine

(i) the magnetic flux linkage through the coil at the maximum magnetic field.

(6 marks)

(ii) the e.m.f. induced in the coil during the first 10 s.

(4 marks)

(iii) the e.m.f. induced in the coil between 10 s to 15 s.

(4 marks)

(iv) From the sign of the induced e.m.f. in **Q5(b)(ii)** and **Q5(b)(iii)**, conclude the relation between magnetic flux and induced e.m.f.

(2 marks)

(c) (i) Give **two (2)** types of sources of electromotive force, e.m.f.

(2 marks)

-END OF QUESTIONS –

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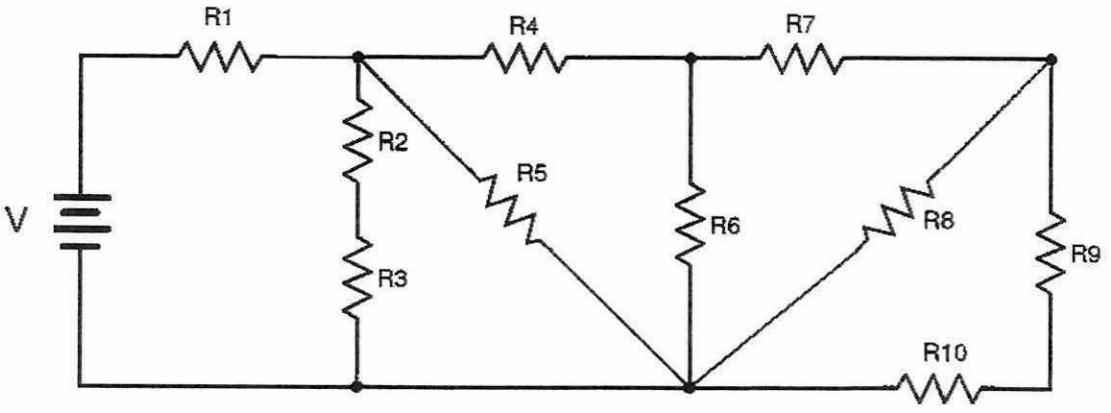

Figure Q1(b)

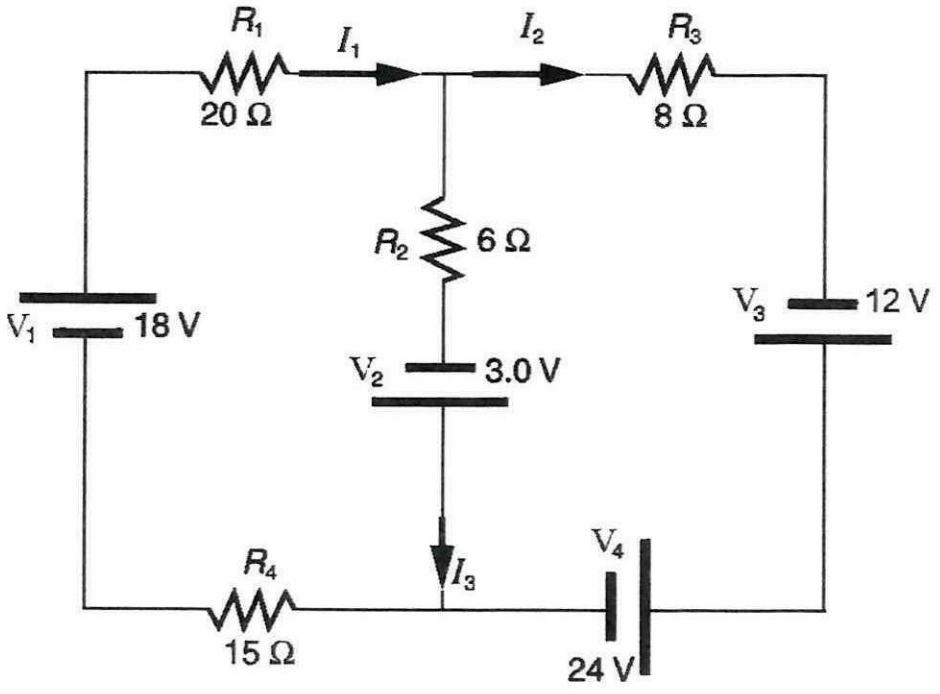

Figure Q2(a)

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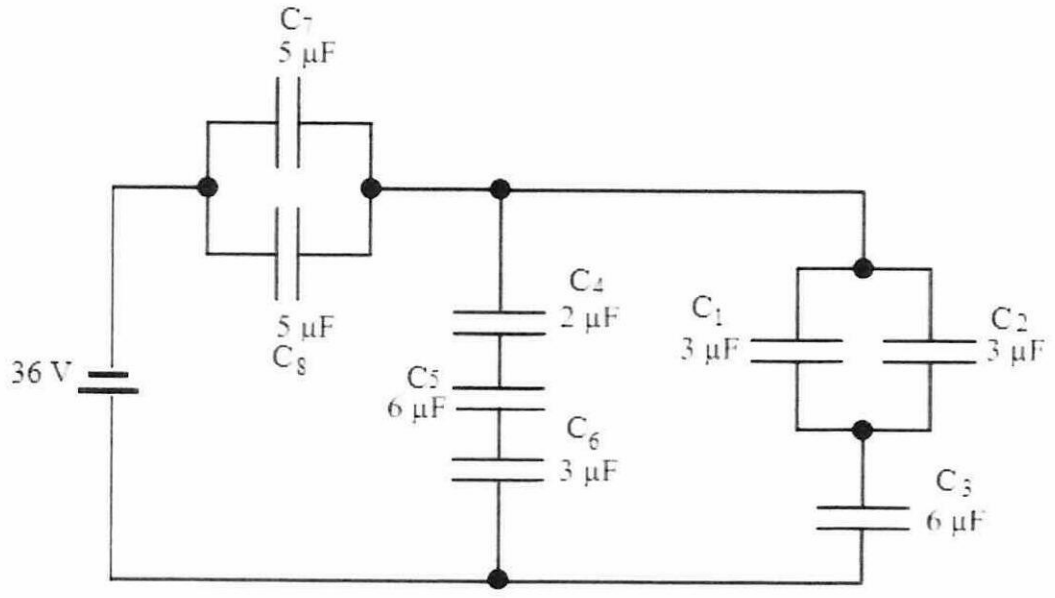

Figure Q3(a)

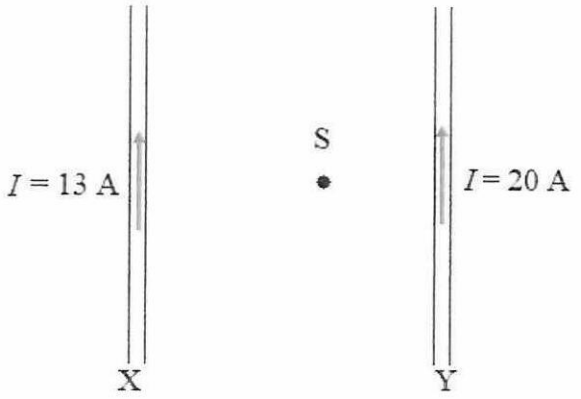

Figure Q4(b)

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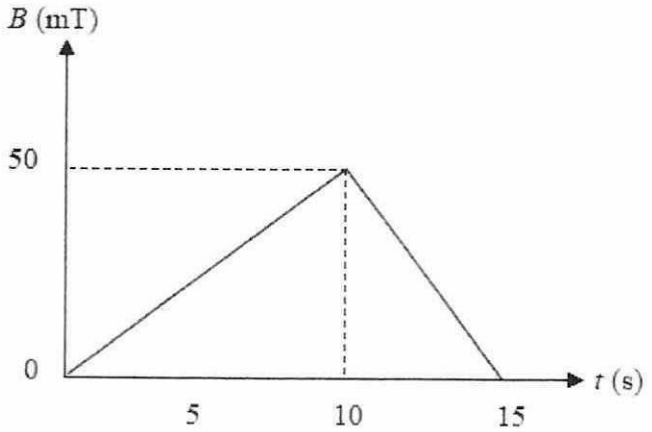

Figure Q5(b)

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LIST OF FORMULAE

$E = hf$	$V = IR$	$n = \frac{N}{L}$	$F = \frac{\mu_0}{2\pi}(\frac{I_1 I_2}{d})l$
$A = \pi r^2$	$U = mgh$	$\Delta K = -\Delta U$	$F = \frac{\mu_0}{2\pi}(\frac{I_1}{d})l$
$\phi = hf_o$	$L = mvr = \frac{nh}{2\pi}$	$W_n = \Delta K$	$F = Bqv \sin\theta$
$K = eV_s$	$R = \sqrt{R_x^2 + R_y^2}$	$W = F\Delta x$	$\varepsilon = Blv \sin\theta$
$hf = K_{max} + \phi$	$E = \frac{F}{q}$	$W = q\Delta V$	$B = \mu_o nI$
$LP = m \cdot v$	$J = \frac{I}{A}\theta$	$q = ne$	$\Delta\Phi = \Phi_2 - \Phi_1$
$K = \frac{ke^2}{2r}$	$\frac{V_s}{V_p} = \frac{N_s}{N_p}$	$B = \frac{\mu_o I}{2\pi d}$	$E = \frac{q}{4\pi\varepsilon_o(r)^2}$
$E = \frac{kQ}{d^2}$	$C = \frac{\varepsilon_o A}{d}$	$K = \frac{1}{2}mv^2$	$f_o = \frac{\phi}{h} = \frac{hc}{h\lambda}$
$F = \frac{kq_1q_2}{d^2}$	$\varepsilon = -N\frac{d\Phi}{dt}$	$v = \frac{BI}{neA}$	$e = -1.6x10^{-19}\,C$
$P = I^2R$	$\varepsilon = -L\frac{dI}{dt}$	$E = \frac{\sigma}{\varepsilon}$	$\Phi = NBA \cos\theta$
$F = mv^2$	$\phi = \frac{hf_0}{e}$	$k = \frac{1}{4\pi\varepsilon_0}$	$h = 6.63 \times 10^{-34}\,Js$
$v = \frac{L}{t}$	$v = \frac{LI}{ne}$	$v = \frac{I}{neA}$	$\varepsilon = BAN\,\omega \sin\omega t$
$F = \frac{ke^2}{r}$	$C = \frac{\varepsilon_r\varepsilon_o A}{d}$	$\Phi = BA$	$c = 3.0\,X\,10^8\,ms^{-1}$
$I = \frac{Q}{t}$	$U = -\frac{ke^2}{r}$	$C = \frac{Q}{V}$	$\mu_o = 4\pi\,x10^{-7}Tm$

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LIST OF CONSTANTS

1. Gravity acceleration, $g = 9.81\ m \cdot s^{-2}$
2. Rydberg constant, $R = 1.097 \times 10^{7}\ m^{-1}$
3. Permeability of free space, $\mu_o = 4\pi \times 10^{-7}\ N \cdot m^{-1}$
4. Permittivity of free space, $\varepsilon_o = 8.854 \times 10^{-12}\ (N \cdot m)^{-2} \cdot C^2$
5. Planck constant, $h = 6.63 \times 10^{-19}\ J \cdot s$
6. Speed of light in air, $c = 3.00 \times 10^{8}\ m \cdot s^{-1}$
7. Charge of electron, $e = 1.602 \times 10^{-19}\ C$
8. Coulomb constant, $k = 9.0 \times 10^{9}\ N \cdot m^2 \cdot C^{-2}$
9. Resistivity of copper, $\rho_{copper} = 1.67 \times 10^{-8}\ \Omega \cdot m$
10. Mass of electron, $m_e = 9.1 \times 10^{-31}\ kg$
11. Mass of proton, $m_p = 1.673 \times 10^{-27}\ kg$