SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SEMESTER II : 2023/2024

FB20064 : PHYSICS 2

TARIKH : 28 MEI 2024
MASA : 11.30 PAGI – 1.30 PETANG (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Soalan Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1

(a) The Diagram 1(a) below shows two charges placed along a straight line AB with the electric field lines. The magnitude of Q_2 is more than of Q_1. Identify what kind of charges Q_1 and Q_2. Then sketch a diagram to show the electric field lines of the charge Q_1 and Q_2.

Rajah 1(a) di bawah menunjukkan dua cas diletakkan di sepanjang garis lurus AB dengan garis medan elektrik. Magnitud Q_2 adalah lebih tinggi dari Q_1. Kenal pasti jenis cas Q_1 dan Q_2. Kemudian lakarkan satu rajah untuk menunjukkan garisan medan elektrik daripada cas Q_1 dan Q2..

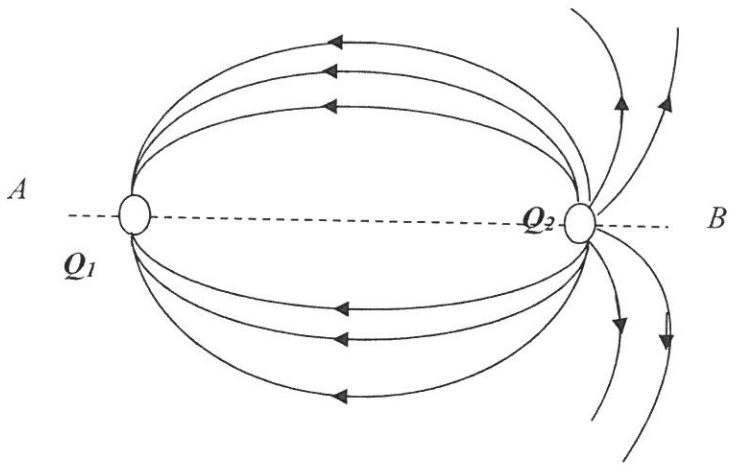


Diagram 1(a) / *Rajah 1(a)*

[5 marks]

[*5 markah*]

CLO1 (b) Based on Figure 1 below, determine the total capacitance of the circuit.

Berdasarkan rajah 1 di bawah, cari nilai kapasitan keseluruhan bagi litar di bawah.

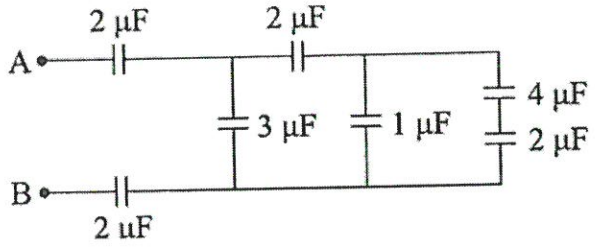


Figure 1 / *Rajah 1*

[8 marks]
[*8 markah*]

CLO2 (c) i) A capacitor of capacitance 2000 μF is charged up to 12.0 mC. Determine the voltage across the capacitor and the energy stored in the capacitor.

Kapasitor bermuatan 2000 μF dicas sehingga 12.0 mC. Tentukan voltan merentasi kapasitor dan tenaga yang disimpan dalam kapasitor

[4 marks]
[*4 markah*]

ii) An uncharged capacitor of 58 μF is connected in series with a 100 k Ω resistor. The capacitor is then started charging through a resistor. Calculate the time required for the capacitor to reach 30% of its maximum charge.

Kapasitor tidak bercas sebanyak 58 μF disambung secara bersiri dengan perintang 100 k Ω. Kapasitor kemudiannya mengecas melalui perintang. Kira masa yang diperlukan untuk kapasitor mencapai 30% daripada cas maksimumnya.

[8 marks]
[*8 markah*]

QUESTION 2
SOALAN 2

CLO1 (a) Give the differences between e.m.f and potential difference.

Berikan perbezaan antara e.m.f dan beza upaya.

[5 marks]
[*5 markah*]

CLO1 (b) A 12.0 V battery has an internal resistance of 1.5 Ω. The battery is now connected to a series circuit which consisted of a light bulb of 20 Ω and a resistor of 10 Ω. The potential difference across the terminal of the battery is measured again with the voltmeter. State the reading of the voltmeter and find the new reading of the voltmeter.

Bateri 12.0 V mempunyai rintangan dalaman sebanyak 1.5 Ω. Bateri kini disambungkan ke litar siri yang terdiri daripada mentol lampu 20 Ω dan rintangan 10 Ω. Perbezaan potensi di seluruh terminal bateri diukur lagi dengan meter volt. Nyatakan bacaan meter volt dan cari bacaan baru meter volt.

[8 marks]
[8 *markah*]

CLO2

(c) The Diagram 2(c) below shows a battery with an emf of 12 V connected to three resistors with resistance of 10 Ω, 20 Ω and 30 Ω.

Rajah 2(c) di bawah menunjukkan bateri dengan emf 12 V disambungkan kepada tiga perintang dengan rintangan 10 Ω, 20 Ω dan 30 Ω.

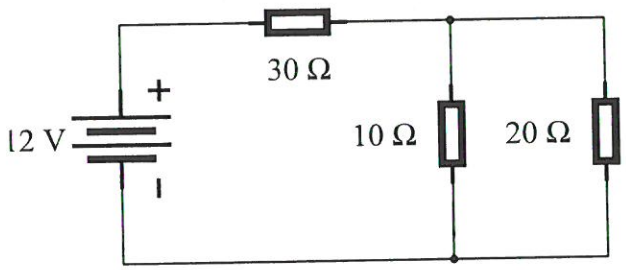


Diagram 2(c) / *Rajah 2(c)*

i) Find the effective resistance (R_{eff}) of the circuit

Cari rintangan berkesan (R_{eff}) litar tersebut.

[4 marks]
[4 *markah*]

ii) Calculate the current (I) that flow through the 20 Ω resistor and voltage (V) across the 30 Ω resistor.

Hitumg arus (I) yang mengalir melalui perintang 20 Ω dan voltan (V) di seluruh perintang 30 Ω.

[8 marks]
[*8 markah*]

QUESTION 3
SOALAN 3

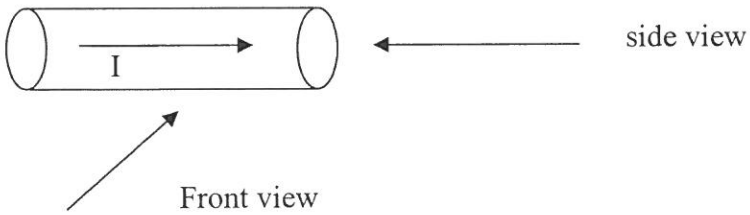
CLO1 (a) Define Magnetic Field and list (3) THREE sources of Magnetic Field.

Tentukan Medan Magnet dan senaraikan 3 (TIGA) sumber Medan Magnet.

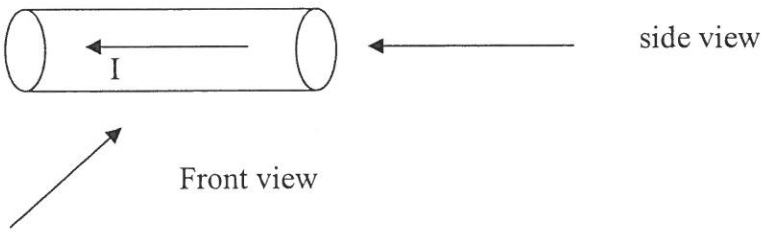
[5 marks]
[*5 markah*]

CLO2 (b) Sketch the magnetic field lines of the straight current-carrying wire in the Diagram 3(b) below from the points of view indicated.

Lakarkan garisan medan magnet wayar pembawa arus lurus dalam Rajah 3(b)di bawah dari sudut pandangan yang ditunjukkan.



(i)



(ii)

Diagram 3b / *Rajah 3b*

[7 marks]
[*7 markah*]

CLO2 (c) i) A wire with a 60 cm length carrying a current of 10.0 A is placed in a region of uniform magnetic field with a flux density of 1.25 T. If the magnetic force acting on the wire is 3.0 N, find the angle between the wire and the magnetic field.

Seutas dawai dengan panjang 60 cm yang membawa arus aa 10.0 A diletakkan di kawasan magnet seragam berfail dengan ketumpatan fluks 1.25T. Jika daya magnet yang bertindak pada wayar ialah 3.0 N, cari sudut antara wayar dan medan magnet.

[5 marks]

[*5 markah*]

CLO2 ii) In an experiment, a 54 g copper wire with the length of 1.2 m is suspended horizontally in a magnetic field of magnetic flux density, 1.2 T, by passing certain amount of current, I form one end to another. **Sketch a diagram to show the arrangement and the forces acting on copper wire for this experiment** (Indicate the direction of the magnetic field with respect to a copper wire and the direction of the current, I in the wire). **Then calculate the current, I in the copper wire.**

Dalam eksperimen, dawai kuprum berjisim 54 g dan panjang 1.2 m digantung secara mendatar dalam medan magnet dengan ketumpatan fluks magnet, 1.2 T, dengan menghantar sejumlah arus tertentu, arus mengalir dari satu hujung ke hujung yang lain. ***Lakarkan rajah untuk menunjukkan susunan dan daya yang bertindak pada dawai kuprum untuk eksperimen ini*** *(Nyatakan arah medan magnet berkenaan dengan wayar kuprum dan arah arus, I dalam wayar).* ***Kemudian hitung arus, I dalam wayar kuprum.***

[8 marks]

[*8 markah*]

QUESTION 4
SOALAN 4

CLO1 (a) The Diagram Q4(a) below shows the variation of the voltage with time for a circuit which is connected to an alternative current source. State the frequency(F) of the source and find root mean square voltage (V_{rms}).

Rajah Q4(a) di bawah menunjukkan variasi voltan dengan masa untuk litar yang disambungkan ke sumber arus alternatif. Nyatakan sumber frekuensi (F) dan cari voltan punca min kuasa dua (V_{rms})

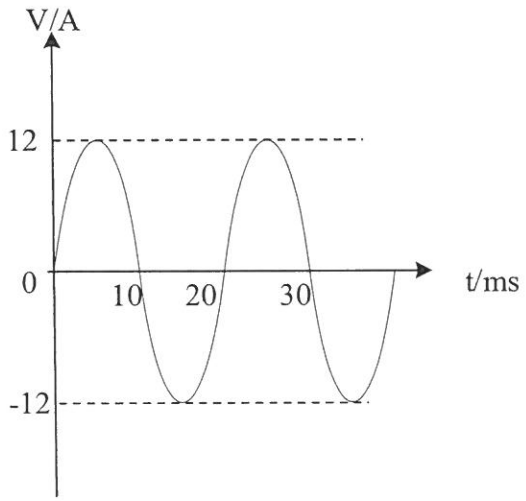


Diagram 3(a) / *Rajah 3(a)*

[5 marks]
[5 *markah*]

CLO1 (b) A series RLC circuit consisting of 35 mH inductor, 45 μF capacitor and 85 Ω resistor are connected to an AC generator of 150 V, 60 Hz. Determine the capacitive reactance (X_C), inductive reactance (X_L) and impedance (Z).

Litar RLC siri yang terdiri daripada pengaruh 35 mH, pemuat 45 μF dan perintang 85 Ω disambungkan ke penjana AC 150 V, 60 Hz. Cari regangan kemuatan (X_C), regangan beraruhan (X_L) dan galangan (Z).

[7 marks]
[7 *markah*]

CLO2 (c) i) A 50 turns coil with cross-sectional area of 5.8×10^{-3} m^2 is placed in a uniform magnetic field of 1.5 T. Find the magnetic flux linkage in the coil when the plane of the coil makes an angle of 60° to the magnetic field.

Gegelung 50 putaran dengan luas keratan rentas 5.8×10^{-3} m^2 diletakkan dalam medan magnet seragam 1.5 T. Cari pautan fluks magnet di gegelung apabila satah gegelung membuat sudut 60° ke medan magnet.

[5 marks]
[*5 markah*]

ii) A solenoid of 500 turns has a radius of 0.024m and length 20 cm carrying a current of 3.4 A. Calculate the inductance of the solenoid and the energy stored in the solenoid.

Satu solenoid 500 putaran dengan jejari 0.024m dan panjang 20 cm membawa arus 3.4 A. Hitung keraruhan solenoid dan tenaga yang tersimpan dalam solenoid.

[8 marks]
[*8 markah*]

SOALAN TAMAT

FORMULA SHEET FOR PHYSICS 2 (FB20064)

Electrostatics	
$F = \frac{Qq}{4\pi\varepsilon_o r^2}$ $\varepsilon_0 = 8.85 \times 10^{-12}\, C^2 N^{-1} m^{-2}$	$F = \frac{kq_1q_2}{r^2}$ $k = 9.0 \times 10^9\, Nm^2 C^{-2}$
$E = \frac{F}{q_0}$	$E = \frac{kQ}{r^2}$
$V = \frac{W}{q_0}$	$V = \frac{kQ}{r}$
$\Delta U = q\Delta V$	$U = k\left(\frac{q_1q_2}{r_{12}}\right)$
$E = \frac{\Delta V}{d}$	
Capacitor and Dielectric	
$C = \frac{Q}{V}$	$U = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C}$
$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_n}$	$C = C_1 + C_2 + \cdots + C_n$
$Q = Q_o e^{\frac{-t}{RC}}$ *for discharging*	$Q = Q_o(1 - e^{\frac{-t}{RC}})$ *for charging*
$\tau = RC$	$\varepsilon_r = \frac{\varepsilon}{\varepsilon_o}$
$C_o = \frac{\varepsilon_o A}{d}$	$C = \varepsilon_r C_o$
Electric Current and DC Circuit	
$I = \frac{dQ}{dt}$	$\varepsilon = \frac{P}{I}$
$V = \varepsilon - Ir$	$P = IV$
$V_1 = \left(\frac{R_1}{R_1 + R_2 + \cdots + R_n}\right)V$	$Q = ne$
$V = IR$	$\rho = \frac{RA}{l}$
$R = R_1 + R_2 + \cdots + R_n$	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$
Magnetism	
$B_{long\ straight\ wire} = \frac{\mu_o I}{2\pi r}$	$B_{circular\ coil} = \frac{\mu_o I}{2r}$
$B_{solenoid} = \mu_o nI$	$B_{end\ of\ solenoid} = \frac{1}{2}\mu_o nI$

$\mu_o = 4\pi \text{ x } 10^{-7} Hm^{-1}$	$\vec{F} = q\vec{v} \text{ x } \vec{B}$
$\vec{F} = qvBsin\theta$	$\vec{F} = I\vec{l} \text{ x } \vec{B}$
$\frac{F}{l} = \frac{\mu_o I_1 I_2}{2\pi d}$	$\vec{F} = IlBsin\theta$
$v = \frac{E}{B}$	
Electromagnetic Induction	
$\phi = \vec{B} \cdot \vec{A}$	$\phi = BAcos\theta$
$\Phi = N\,\phi$	$\xi = -\frac{d\phi}{dt}$
$\xi_{straight\ conductor} = Blv\ sin\theta$	$\xi_{coil} = -NA\frac{dB}{dt}$
$\xi_{coil} = -NB\frac{dA}{dt}$	$\xi_{rotating\ coil} = NAB\omega\ sin\omega t$
$L = -\frac{\xi}{\left(\frac{dI}{dt}\right)}$	$L = \frac{N\,\phi}{I}$
$L_{coil} = \frac{\mu_o N^2 \text{A}}{2r}$	$L_{solenoid} = \frac{\mu_o N^2 \text{A}}{l}$
$U = \frac{1}{2}LI^2$	$M = \frac{\mu_o N_1 N_2 \text{A}}{l}$
$\xi = -\text{L}\left(\frac{dI}{dt}\right)$	
Alternating Current	
$V = V_o sin\,\omega t$	$I = I_o sin\,\omega t$
$Z = \sqrt{R^2 + (X_L - X_C)^2}$	$P_{av} = I_{rms}V_{rms}cos\theta$
$cos\,\phi = \frac{P_r}{P_a} = \frac{P_{ave}}{I_{rms}V_{rms}}$	$I_{rms} = \frac{I_0}{\sqrt{2}}$
$V_{rms} = \frac{V_0}{\sqrt{2}}$	$X_C = \frac{1}{2\pi fc}$
$X_L = 2\pi fL$	$\emptyset = tan^{-1}\frac{(X_L - X_C)}{R}$
$cos\,\phi = \frac{R}{Z}$	