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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2025/2026

FB20073: PHYSICS 2

TARIKH : 25 MEI 2026
MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

TERBUKA

INSTRUCTION:

This section consists of **FOUR (4)** subjective questions. Answers **ALL** questions.

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1 (a) i) Define a capacitor and draw its symbol.

Apa itu kapasitor dan lukiskan simbolnya.

[2 marks]

[*2 markah*]

ii) List **TWO (2)** applications of capacitors.

*Senaraikan **DUA (2)** penggunaan kapasitor.*

[2 marks]

[*2 markah*]

CLO1 (b) Identify two types of capacitor arrangements in an electric circuit. Draw a simple circuit diagram for each type.

Kenal pasti dua jenis susunan kapasitor dalam litar elektrik. Lukiskan rajah litar ringkas bagi setiap jenis susunan tersebut.

[4 marks]

[*4 markah*]

TERBUKA

CLO2 *(c)* A current of 4.0 A flows through a solenoid of 600 turns. The length of the solenoid is 30 cm and its cross-sectional area is 3.0 cm². When the switch is opened, the current in the solenoid decreases uniformly to zero in 0.15 s. Given the permeability of free space, $\mu_o = 4\pi \times 10^{-7} \text{Hm}^{-1}$. Calculate

Arus sebanyak 4.0 A mengalir melalui sebuah solenoid yang mempunyai 600 lilitan. Panjang solenoid ialah 30 cm dan luas keratan rentasnya ialah 3.0 cm². Apabila suis dibuka, arus dalam solenoid berkurang secara seragam kepada sifar dalam masa 0.15 s. Diberi pemalar kebolehtelapan vakum, $\mu_o = 4\pi \times 10^{-7} \text{Hm}^{-1}$. *Kirakan*

i) the inductance of the solenoid.
induktans solenoid tersebut.

[7 marks]
[*7 markah*]

ii) the energy stored in the magnetic field of the solenoid when the current is 4000 mA.
Tenaga yang tersimpan di dalam medan magnet solenoid semasa arus 4000 mA mengalir.

[5 marks]
[*5 markah*]

iii) the induced electromotive force (e.m.f) produced when the current decreases to zero.
Nilai daya gerak elektrik (d.g.e) aruhan yang terhasil semasa arus berkurang kepada sifar.

TERBUKA

[5 marks]
[*5 markah*]

QUESTION 2

SOALAN 2

CLO1

(a) A circular coil with a radius of 30 cm carries a current in a clockwise direction. If the magnitude of the magnetic field at the centre of the coil is given,

Satu gegelung bulat berjari-jari 30 cm membawa arus elektrik yang mengikut arah jam. Jika magnitud medan magnet di pusat gegelung diberikan,

i) Draw a simple diagram to show the direction of the current and the magnetic field.

Lukiskan satu rajah ringkas untuk menunjukkan arah arus dan arah medan magnet.

[4 marks]

[*4 markah*]

ii) State the direction of the magnitude field inside the coil and state the physics rule used to determine the direction of that magnetic field.

Nyatakan arah medan magnet di dalam gegelung dan nyatakan hukum fizik yang digunakan untuk menentukan arah medan magnet tersebut.

[2 marks]

[*2 markah*]

TERBUKA

CLO2

(b) i) Figure 2b (i) shows a proton moving into a uniform magnetic field of B with its velocity perpendicular to the magnetic field B. Draw the path taken by the proton in the magnetic field, the force exerted on the proton and mark this force as F in the diagram.

Rajah 2b (i) menunjukkan satu proton bergerak memasuki medan magnet seragam dengan kekuatan B dan bergerak secara serenjang terhadap arah medan magnet B. Lukiskan laluan yang diambil oleh proton dalam medan magnet, lukiskan daya yang bertindak ke atas proton dan tandakan daya tersebut sebagai F pada rajah

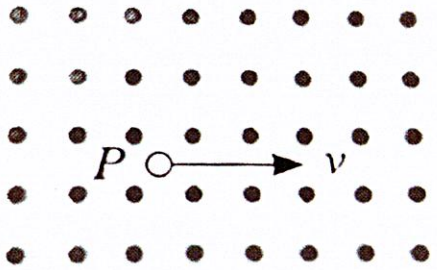


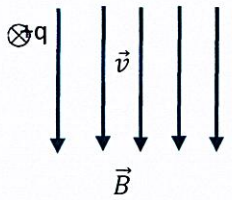
Figure 2b (i) / *Rajah 2b (i)*

[3 marks]

[*3 markah*]

ii) Figure 2(c) shows charge moving in magnetic field. Determine the direction of the magnetic force acting on the charge.

Rajah 2(c) menunjukkan satu cas yang bergerak dalam medan magnet. Tentukan arah daya magnet yang bertindak ke atas cas tersebut.



Note: $\vec{v}$ *into the page*

Figure 2b (ii) / *Rajah 2b (ii)*

TERBUKA

[3 marks]

[*3 markah*]

iii) A straight wire, of mass per unit length is placed in a uniform horizontal magnetic field. When a current flows through the wire from right to left, the force acting on it just balances its weight so that it can float. Draw a diagram to show the direction of the magnetic field and the forces acting on the wire.

Seutas dawai lurus yang mempunyai jisim per unit panjang diletakkan dalam suatu medan magnet seragam mengufuk. Apabila arus mengalir melalui dawai dari kanan ke kiri, daya yang bertindak ke atasnya tepat mengimbangi beratnya sehingga dawai itu terapung. Lukiskan rajah yang menunjukkan arah medan magnet dan daya-daya yang bertindak ke atas dawai tersebut.

[3 marks]

[*3 markah*]

CLO2

(c) i. Figure 2c (i) shows two long straight parallel wires are placed 0.25 m apart in a vacuum. Each wire carries a current of 2.4 A in the same direction. Calculate the **force per unit length** between the wires. If the current in one wire is reduced to 0.64 A, calculate the current needed in the second wire to maintain the same force per unit length between the wires. (Given $\mu_o = 4\pi \times 10^{-7}\text{Hm}^{-1}$)

Rajah 2c (i) menunjukkan dua dawai lurus panjang yang selari diletakkan pada jarak 0.25 m antara satu sama lain di dalam vakum. Setiap dawai membawa arus elektrik sebanyak 2.4 A dalam arah yang sama. Hitung ***daya per unit panjang*** *antara kedua-dua dawai tersebut. Jika arus dalam salah satu dawai dikurangkan kepada 0.64 A, hitung arus yang diperlukan dalam dawai kedua supaya daya per unit panjang antara kedua-dua dawai kekal sama seperti yang ditunjukkan dalam rajah di bawah.* (Diberi $\mu_o = 4\pi \times 10^{-7} Hm^{-1}$)

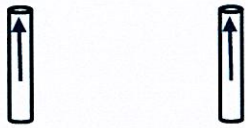


Figure 2c (i) / *Rajah 2c (i)*

[6 marks]

[*6 markah*]

TERBUKA

ii. An electron moves in a straight line through uniform electric and magnetic field that are mutually perpendicular. The magnitudes of the field are 0.3 mT and $4.2 \times 10^3\ \mathrm{NC}^{-1}$. If the mass of the electron is 9.11×10^{-31}kg, calculate the energy of the electron.

Satu elektron bergerak dalam satu garis lurus melalui medan elektrik dan medan magnet seragam yang saling berserenjang. Magnitud medan tersebut masing- masing adalah 0.3 mT dan $4.2 \times 10^3\ N\,C^{-1}$. *Jika jisim elektron adalah* $9.11 \times 10^{-31} kg$, *hitung tenaga elektron tersebut.*

TERBUKA

[4 marks]
[*4 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) i. Define alternate current.

Takrifkan arus terus.

[2 marks]

[*2 markah*]

ii. Define root mean square (r.m.s) AC current.

Takrifkan nilai punca min kuasa dua (r.m.s) aruns ulang alik.

[2 marks]

[*2 markah*]

CLO1 (b) An alternating current is given by the equation $I = I_0 \sin \omega t$. Write the expression for the RMS value of this current. State what is I_o and its unit.

Suatu arus ulang-alik diberi oleh persamaan $I = I_0 \sin \omega t$. *Tuliskan ungkapan bagi nilai RMS arus tersebut. Nyatakan apakah* I_0 *dan unitnya.*

[4 marks]

[*4 markah*]

CLO2 (c) i. A series RLC circuit consisting of a 35 mH inductor, 25μF capacitor and 85 Ω resistor are connected to an AC generator of 150 V, 60 Hz. Calculate the capacitive reactance X_c, the inductive reactance X_L, the impedance Z, and the phase angle,

Satu litar RLC bersiri yang terdiri daripada induktor 35 mH, kapasitor 25 μF dan perintang 85 Ω disambungkan kepada sebuah penjana arus ulang-alik (AC) 150 V, 60 Hz. Hitungkan reaktans kapasitif, $\boldsymbol{X_C}$, *reaktans aruhan,* X_L *, impedans,* Z *dan sudut fasa.*

TERBUKA

[9 marks]

[*9 markah*]

ii. In an RLC series circuit, the alternating supply voltage, V and current, I are given by the equations

$$V = 100 \sin 100t \qquad I = 100\left(100t + \frac{\pi}{3}\right)$$

Where V is in V, I in mA and t is in s. Find the average power dissipated in the circuit.

Dalam satu litar RLC bersiri, voltan bekalan arus ulang-alik, **V** *dan arus,* I *masing-masing diberikan oleh persamaan.*

$$V = 100 \sin 100t \qquad I = 100\left(100t + \frac{\pi}{3}\right)$$

Di mana V *dalam volt (V),* I *dalam miliampere (mA) dan* **t** *dalam saat (s). Cari kuasa purata yang terlesap dalam litar tersebut.*

[4 marks]

[*4 markah*]

iii. An inductor coil draws a current of 3.2 A and dissipates a power of 420W when connected to a 240 V, 60 Hz AC power source. Determine the power factor.

Satu gegelung induktor menarik arus sebanyak 3.2 A dan melesapkan kuasa sebanyak 420 W *apabila disambungkan kepada sumber kuasa arus ulang-alik (AC) 240 V, 60 Hz. Tentukan faktor kuasa.*

[4 marks]

[*4 markah*]

TERBUKA

QUESTION 4

SOALAN 4

CLO1 (a) i. State **TWO (2)** laws of reflection.

*Nyatakan **DUA (2)** hukum pantulan.*

[2 marks]

[*2 markah*]

ii. A dentist would like to examine the teeth of his patient using a dental mirror. What type of mirror should he use? Why?

Seorang doktor gigi ingin memeriksa gigi pesakitnya menggunakan cermin pergigian. Apakah jenis cermin yang perlu digunakan? Mengapa?

[2 marks]

[*2 markah*]

CLO1 (b) Describe Huygen's Principle. Then, sketch the wavefronts of light after passing through a slit.

Terangkan Prinsip Huygens. Seterusnya lukiskan muka gelombang cahaya selepas melalui satu celah.

[4 marks]

[*4 markah*]

CLO2 (c) i. Two converging lenses with focal lengths of 1.5 cm and 4 cm are placed apart. An object is placed 2 cm in front of the first lens. Calculate the final image distance, the overall magnification and state whether the image is upright or inverted.

Dua kanta cembung dengan panjang fokus 1.5 cm dan 4 cm diletakkan berasingan. Satu objek diletakkan 2 cm di hadapan kanta pertama. Hitungkan jarak imej akhir, pembesaran keseluruhan dan nyatakan sama ada imej itu tegak atau songsang.

TERBUKA

[9 marks]

[*9 markah*]

ii. A single slit with a width of 2.0 mm is illuminated by light with a wavelength of 500 nm. The diffraction pattern is seen on the screen at the distance of 4.0 m away. Calculate the width of the central minimum.

Satu celah tunggal dengan lebar 2.0 mm diterangi oleh cahaya dengan panjang gelombang 500 nm. Corak pembelauan (difraksi) dilihat pada skrin yang terletak 4.0 m jauhnya. Hitungkan lebar minimum pusat.

[4 marks]

[*4 markah*]

iii. A sodium light of wavelength 580 nm shines through a slit and produces a diffraction pattern on a screen 0.60 m away. The width of the central maximum fringe on the screen is 5.0 cm. Determine the width of the slit and the angular width of the central maximum fringe.

Cahaya natrium dengan panjang gelombang 580 nm melalui satu celah dan menghasilkan corak difraksi pada skrin yang terletak 0.60 m jauhnya. Lebar jalur maksimum pusat pada skrin ialah 5.0 cm. Tentukan lebar celah, lebar sudut jalur maksimum pusat

[4 marks]

[*4 markah*]

TERBUKA

SOALAN TAMAT

FORMULA SHEET FOR PHYSICS 2 (FB20073)

Electrostatics	
$F = \frac{Qq}{4\pi\varepsilon_0 r^2}$	$F = \frac{kq_1q_2}{r^2}$
$E = \frac{F}{q_0}$	$E = \frac{kQ}{r^2}$
$V = \frac{W}{q_0}$	$V = \frac{kQ}{r}$
$\Delta U = q\Delta V$	$U = k\left(\frac{q_1q_2}{r_{12}}\right)$
$E = \frac{\Delta V}{d}$	$k = 9.0 \times 10^9 Nm^2C^{*-2}$
$\varepsilon_0 = 8.85 \times 10^{-12} C^2N^{-1}m^{-2}$	
Capacitor and Dielectric	
$C = \frac{Q}{V}$	$U = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C}$
$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_n}$	$C = C_1 + C_2 + \cdots + C_n$
$Q = Q_0 e^{-\frac{t}{RC}}$ for discharging	$Q = Q_0\left(1 - e^{-\frac{t}{RC}}\right)$ for charging
$\tau = RC$	$\varepsilon_r = \frac{\varepsilon}{\varepsilon_0}$
$C_0 = \frac{\varepsilon_0 A}{d}$	$C = \varepsilon_r C_0$
Electric Current and DC Circuit	
$I = \frac{dQ}{dt}$	$I = \frac{Ne}{t} = ne$
$Q = ne$	$V = IR$
$\rho = \frac{RA}{l}$	$R = R_o[1 + \alpha(T - T_o)]$
$\rho = \rho_o[1 + \alpha(T - T_o)]$	$V = \varepsilon - Ir$
$\varepsilon = \frac{P}{I}$	$R_T = R_1 + R_2 + \ldots + R_n$

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$	$P = IV = I^2R = \frac{V^2}{R}$
$E = VIt$	$V_1 = \left(\frac{R_1}{R_1 + R_2 + \cdots + R_n}\right)V$
$\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$	$e = 1.60 \times 10^{-19} C$
$m_e = 9.11 \times 10^{-31}\ kg = 5.49 \times 10^{-4} u$	$m_n = 1.674 \times 10^{-27}\ kg = 1.008665\ u$
$m_p = 1.672 \times 10^{-27}\ kg = 1.007277\ u$	
Magnetism	
$B_{long\ straight\ wire} = \frac{\mu_o I}{2\pi r}$	$B_{centre\ of\ a\ circular\ coil} = \frac{\mu_o I}{2r}$
$B_{center\ of\ a\ solenoid} = \mu_o nI$	$B_{end\ of\ a\ solenoid} = \frac{1}{2}\mu_o nI$
$\mu_o = 4\pi \times 10^{-7} Hm^{-1}$	$F = qv \times B$
$F = qvB \sin\theta$	$F = Il \times B$
$\frac{F}{l} = \frac{\mu_o I_1 I_2}{2\pi d}$	$F = IlB \sin\theta$
$\tau = NIAB \sin\theta$	$v = \frac{E}{B}$
Electromagnetic Induction	
$\phi = \vec{B} \cdot \vec{A} = BA \cos\theta$	$\Phi = N\phi$
$\xi = -\frac{d\phi}{dt}$	$\xi_{straight\ conductor} = Blv \sin\theta$
$\xi_{coil} = -NA\frac{dB}{dt}$	$\xi_{coil} = -NB\frac{dA}{dt}$
$\xi_{rotating\ coil} = NAB\omega \sin\omega t$	$\xi = -L\left(\frac{dI}{dt}\right)$
$L = \frac{N\phi}{I}$	$L_{solenoid} = \frac{\mu_0 N^2 A}{l}$
$L_{coil} = \frac{\mu_0 N^2 A}{2r}$	$U = \frac{1}{2}LI^2$
$M = \frac{\mu_0 N_1 N_2 A}{l}$	$\xi = -M\frac{dI}{dt}$

Alternating Current	
$V = V_0 \sin \omega t$	$I = I_0 \sin \omega t$
$I_{rms} = \frac{I_o}{\sqrt{2}}$	$V_{rms} = \frac{V_o}{\sqrt{2}}$
$X_C = \frac{1}{2\pi f C}$	$X_L = 2\pi f L$
$\omega = 2\pi f$	$Z = \sqrt{R^2 + (X_L - X_C)^2}$
$\phi = \tan^{-1} \frac{(X_L - X_C)}{R}$	$\cos \phi = \frac{P_r}{P_a} = \frac{P_{av}}{I_{rms} V_{rms}} = \frac{R}{Z}$
$P_{av} = I_{rms} V_{rms} \cos \theta$	$P_{inst} = IV$
Optics	
$R = 2f$	$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
$M = \frac{h_i}{h_o} = -\frac{v}{u}$	$Spherical\ surface, \frac{n_1}{u} + \frac{n_2}{v} = \frac{n_2 - n_1}{R}$
$\frac{1}{f} = \left(\frac{n_{material}}{n_{medium}} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	$y_m = \frac{m\lambda D}{d}$
$y_m = \frac{\left(m + \frac{1}{2}\right)\lambda D}{d}$	$\Delta y = \frac{\lambda D}{d}$
$2nt = m\lambda$	$2nt = \left(m + \frac{1}{2}\right)\lambda$
$y_n = \frac{n\lambda D}{a}$	$y_n = \frac{\left(n + \frac{1}{2}\right)\lambda D}{a}$
$w = \frac{2\lambda D}{a}$	$d \sin \theta = m\lambda$
$d = \frac{1}{N}$	$\lambda = d \sin \theta$