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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SEMESTER I : 2023/2024

FB10044 : PHYSICS 1

TARIKH : 20 DISEMBER 2023
MASA : 11.15 PAGI – 1.15 PETANG (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

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)** questions. Answer **ALL** questions.

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 (a) (i) State the definition of derive quantities and list **TWO (2)** examples.
*Nyatakan definisi bagi kuantiti terbitan dan senaraikan **DUA (2)** contoh baginya.*

[4 marks]
[*4 markah*]

(ii) What are the dimensions of the physical quantities below?
Apakah dimensi bagi kuantiti fizikal di bawah?

a. Velocity
Halaju

b. Pressure
Tekanan

[4 marks]
[*4 markah*]

CLO1 (b) (i) Describe the differences between a scalar quantity and a vector quantity with **ONE (1)** example.
*Terangkan perbezaan antara kuantiti skalar dan kuantiti vector beserta **SATU (1)** contoh.*

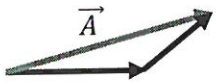
[4 marks]
[*4 markah*]

(ii) Given three vectors labeled $\vec{X}$, $\vec{Y}$ and $\vec{Z}$ as shown in Figure 1(b)(i).
Diberi tiga vektor yang berlabel $\vec{X}$, $\vec{Y}$ dan $\vec{Z}$ *seperti yang ditunjukkan pada Rajah 1(b)(i).*

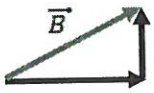
Figure 1(b)(i) / *Rajah 1(b)(i)*

Show an expression using vector $\vec{X}$, $\vec{Y}$ and $\vec{Z}$ for the resultant vector shown below:
Tunjukkan ungkapan daya paduan menggunakan vektor $\vec{X}$, $\vec{Y}$ *dan* $\vec{Z}$ *bagi rajah di bawah:*

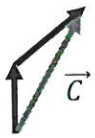
a.



b.



c.



[6 marks]
[*6 markah*]

CLO2 (c) (i) A pushing force of 30 N is exerted on a ball with a mass of 1 kg causes the ball to increase its velocity from 10 ms^{-1} to 20 ms^{-1} with a displacement, *s* on a smooth floor. Calculate the value of *s*.
Daya tolakan 30 N yang dikenakan ke atas sebiji bola berjisim 1 kg menyebabkan halaju bola tersebut meningkat dari 10 ms^{-1} *ke 20* ms^{-1} *dengan sesaran, s pada lantai licin. Hitung nilai s.*

[3 marks]
[*3 markah*]

(ii) A ball with a mass of 0.2 kg is released from a height of 1 m and hits the spring as shown in Figure 1(c)(ii). If the spring has a maximum compression of 0.1 m, calculate its spring constant, *k*.

Sebiji bola berjisim 0.2 kg dilepaskan dari ketinggian 1 m dan mengenai spring seperti yang ditunjukkan dalam Rajah 1(c)(ii). Jika spring mempunyai mampatan maksimum 0.1 m, hitung pemalar spring, k bagi spring tersebut.

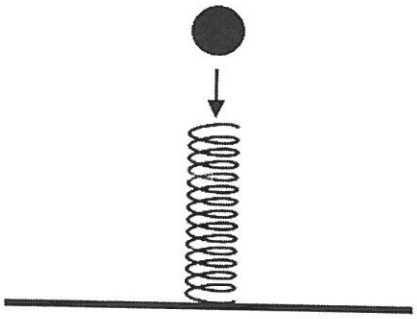


Figure 1(c)(ii) / *Rajah 1(c)(ii)*

[4 marks]

[*4 markah*]

QUESTION 2

SOALAN 2

CLO1

(a) (i) Compare **TWO (2)** differences between distance and displacement.

*Bandingkan **DUA (2)** antara jarak dan sesaran.*

[4 marks]

[*4 markah*]

(ii) The velocity-time graph in Figure 2(a)(ii) represents the motion of a ball. Convert the graph to an acceleration-time graph.
Graf halaju-masa dalam Rajah 2(a)(ii) mewakili gerakan sebiji bola. Tukarkan graf tersebut kepada graf pecutan-masa.

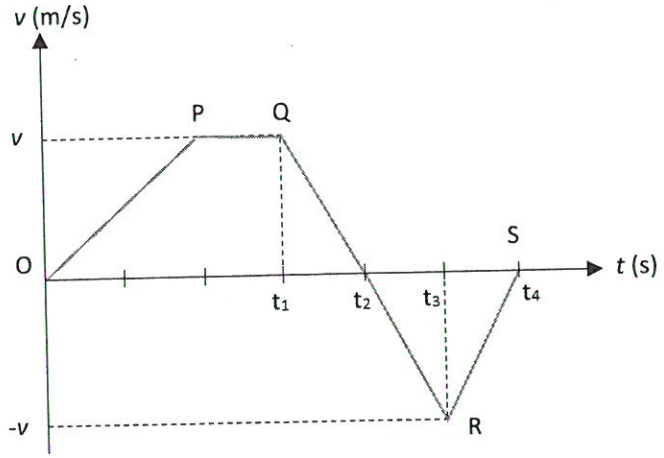


Figure 2(a)(ii) / *Rajah 2(a)(ii)*

[6 marks]
[*6 markah*]

CLO2 (b) An object executes SHM whose displacement x varies with time t according to the relation where x is in centimeters and t is in seconds.

$$x = 8 \sin\left[3\pi + \frac{x}{2}\right]$$

Objek melaksanakan SHM yang anjakannya x berubah dengan masa t mengikut hubungan dengan x dalam sentimeter dan t dalam saat.

$$x = 8 \sin\left[3\pi + \frac{x}{2}\right]$$

(i) Write the equation for velocity, v and acceleration, a of the object at any time, t.
Tuliskan persamaan bagi halaju,v dan pecutan, a objek pada bila-bila masa, t.

[6 marks]
[6 *markah*]

(ii) Determine the maximum value for acceleration of the object at any time, *t*.

Tentukan nilai maksimum pecutan bagi objek pada bila-bila masa, t.

[1 mark]

[1 *markah*]

CLO2 (c) The displacement of an oscillating object as a function of time is shown in Figure 2(c):

Sesaran objek berayun sebagai fungsi masa ditunjukkan dalam Rajah 2(c):

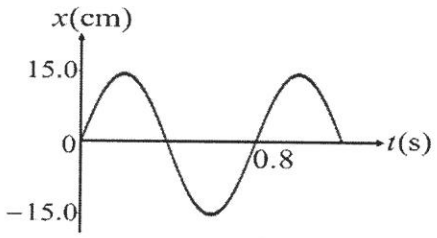


Figure 2(c) / *Rajah 2(c)*

From the graph above, calculate:

Berdasarkan graf di atas, kirakan:

(i) the angular frequency

kekerapan sudut

(ii) the equation of velocity as a function of time.

persamaan halaju sebagai fungsi masa.

(iii) the equation of acceleration as a function of time.

persamaan pecutan sebagai fungsi masa.

[8 marks]

[*8 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) State the definition and SI unit for impulse and momentum.

Nyatakan definisi dan unit SI bagi impuls dan momentum.

[4 marks]

[*4 markah*]

CLO1 (b) Explain the differences between elastic collision and inelastic collision with appropriate diagram.

Terangkan perbezaan antara perlanggaran anjal dan perlanggaran tak anjal dengan gambar rajah yang sesuai.

[6 marks]

[*6 markah*]

CLO2 (c) (i) A 0.5 kg golf ball moves at a speed of 8.0 ms^{-1}. It collides with a 0.6 kg tennis ball, which is moving towards it with a speed of 4.0 ms^{-1}. After the impact, the tennis ball travels in the opposite direction with a speed of 5.0 ms^{-1}. Calculate:

Sebiji bola golf 0.5 kg bergerak pada kelajuan 8.0 ms^{-1}. Bola tersebut berlanggar dengan bola tenis seberat 0.6 kg, yang bergerak ke arahnya dengan kelajuan 4.0 ms^{-1}. Selepas hentaman, bola tenis bergerak ke arah yang bertentangan dengan kelajuan 5.0 ms^{-1}. Hitungkan:

(a) the velocity of the golf ball after collision.

halaju bola golf selepas perlanggaran.

(b) kinetic energy that is lost due to the collision.

tenaga kinetik yang hilang akibat perlanggaran tersebut.

[7 marks]

[*7 markah*]

CLO2

(ii) A force of 30 N pushes a box with a mass of 3 kg on a floor, as shown in Figure 3(c)(ii). The box moves with an acceleration of 2 ms^{-2},
Daya 30 N menolak sebuah kotak berjisim 3 kg di atas lantai, seperti ditunjukkan dalam Rajah 3(c)(ii). Kotak itu bergerak dengan pecutan 2 ms^{-2}.

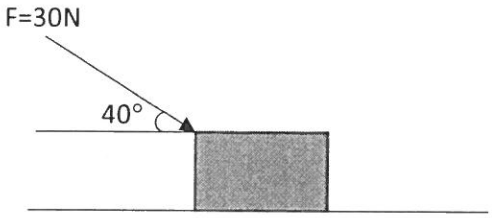


Figure 3(c)(ii) / *Rajah 3(c)(ii)*

(a) Draw a free body diagram of the box.
Lukiskan gambarajah jasad bebas.

(b) Calculate the coefficient of kinetic friction.
Hitung pekali geseran kinetik.

[8 marks]
[8 *markah*]

QUESTION 4

SOALAN 4

CLO1 (a) State the definition of frequency and its SI unit.

Nyatakan definisi bagi frekuensi dan unit SI.

[2 marks]

[2 *markah*]

CLO2 (b) (i) A pendulum bob with a mass of 0.2 kg is attached to one end of a 1.0 m long string. The string is swung horizontally at a speed of 12 ms^{-1}. Calculate the centripetal acceleration of the bob and tension of the spring.

Bob bandul berjisim 0.2 kg dipasang pada satu hujung tali di mana panjang tali tersebut adalah 1.0 m. Tali itu dihayun secara mendatar pada kelajuan 12 ms^{-1}. Kira pecutan sentripetal bob dan tegangan spring.

[4 marks]

[4 *markah*]

(ii) Figure 4(b)(ii) show an object with a mass of 4.0 kg is whirled around in a vertical circle with a radius of 2.0 m at a speed of 5.0 ms^{-1}. Calculate the maximum and minimum tension in the string connecting the object to the center of the circle.

Rajah 4(b)(ii) menunjukkan sebuah objek berjisim 4.0 kg dipusingkan dalam bulatan menegak dengan jejari 2.0 m pada kelajuan 5.0 ms^{-1}. Kira tegangan maksimum dan minimum dalam tali yang menyambungkan objek ke tengah bulatan tersebut.

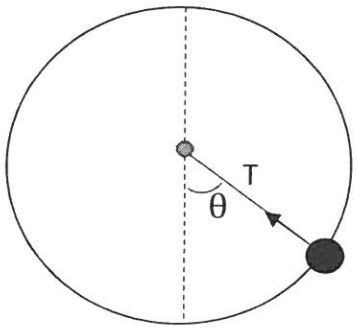


Figure 4(b)(ii)/ *Rajah 4(b)(ii)*

[9 marks]

[9 *markah*]

CLO2 (c) The instantaneous angular velocity, ω of the flywheel is given by $\omega = 7t^3 - t^2$ where ω is radian per second and t in seconds. Calculate:

Halaju sudut ketika itu, ω roda tenaga diberikan oleh $\omega = 7t^3 - t^2$ dengan ω ialah radian sesaat dan t dalam saat. Hitungkan:

(i) the average angular acceleration between 2.0 s and 4.4 s.

purata pecutan sudut antara 2.0 s dan 4.4 s.

[6 marks]

[6 *markah*]

(ii) the instantaneous angular acceleration at time, 3.5 s.

pecutan sudut serta-merta pada masa, 3.5 s.

[4 marks]

[4 *markah*]

SOALAN TAMAT

FORMULA SHEET FOR PHYSICS 1 (FB10044)

Physical Quantities and Measurements	
$\vec{A} \cdot \vec{B} = AB\cos\theta$	$\vec{A} \times \vec{B} = AB\ \sin\theta$
Kinematics of Linear Motion	
$v = u + at$	$s = ut + \frac{1}{2}at^2$
$v^2 = u^2 + 2as$	$s = \frac{1}{2}(u + v)t$
Dynamics of Linear Motion	
$p = mv$	$W = Fs$
Work, Energy and Power	
$F = ma$	$f = \mu N$
$W = Fd$	$W = Fd\ \cos\theta$
$P = Fv; P = \frac{W}{t}$	$\eta = \frac{P_{out}}{P_{in}} \times 100\%$
$K = \frac{1}{2}mv^2$	$W_{total} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$
$U = mgh$	$W = U_f - U_i$
$U_s = \frac{1}{2}kx^2 = \frac{1}{2}Fx$	$E = K + U$
Circular Motion	
$\omega = \omega_0 + \alpha t$	$v = r\omega$
$\theta = \omega_0 + \frac{1}{2}\alpha t^2$	$a_t = r\alpha$
$\theta = \frac{1}{2}(\omega_0 + \omega)t$	$s = r\theta$
$\omega^2 = {\omega_0}^2 + 2\alpha\theta$	$a_c = \frac{v^2}{r} = r\omega^2 = v\omega$
$\omega = \frac{2\pi}{T} = 2\pi f$	$F_c = \frac{mv^2}{r} = mr\omega^2 = mv\omega$
$E = \frac{1}{2}m\omega^2 A^2$	$U = \frac{1}{2}m\omega^2 x^2$

Rotation of Rigid Body	
$P = \tau\omega$	$\tau = rF\sin\theta$
$J = F\Delta t$	$I = \sum mr^2$
$J = \Delta p = mv - mu$	$I_{ring} = MR^2$
$\tau = I\alpha$	$I_{disc/\ solid\ cylinder} = \frac{1}{2}MR^2$
$K = \frac{1}{2}r\omega^2$	$I_{solid\ sphere} = \frac{2}{5}MR^2$
$L = I\omega$	$I_{hollow\ sphere} = \frac{2}{3}MR^2$
$W = \tau\theta$	$I_{rod} = \frac{1}{12}ML^2$
$K = \frac{1}{2}m\omega^2(A^2 - x^2)$	
Oscillations and Waves	
$x = A\sin\omega t$	$\frac{d(sinx)}{dt} = cosx\ ;\quad \frac{d(\cos x)}{dt} = -sin\ x$
$v = \frac{dy}{dt} = \omega A\cos\omega t\ = \pm\omega\sqrt{A^2 - x^2}$	$a = \frac{dv}{dt} = \frac{d^2x}{dt^2} = -A\omega^2 Sin\ \omega t = -\omega^2 x$
$y(x,t) = A\sin(\omega t \pm kx)$	$y = A\cos kx\sin\omega t$
$v_y = A\omega\cos(\omega t \pm kx)$	$v = \sqrt{\frac{T}{\mu}}$
$f_n = \frac{nv}{2L}$	$f = \frac{1}{T}$
$f_n = \frac{n}{2L}\sqrt{\frac{T}{\mu}}$	$v = \frac{f}{\lambda}$
$k = \frac{2\pi}{\lambda}$	$T = 2\pi\sqrt{\frac{l}{g}}\ ;\ T = 2\pi\sqrt{\frac{m}{k}}$
$\mu = \frac{m}{l}$	$f_a = \left(\frac{v \pm v_0}{v \mp v_s}\right)f$