SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN ASASI TEKNOLOGI KEJURUTERAAN

PEPERIKSAAN AKHIR

SEMESTER I : 2024/2025

FB10073: PHYSICS 1

TARIKH : 18 DISEMBER 2024
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)

SULIT

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

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

QUESTION 1
SOALAN 1

CLO1 (a) i. Interpret the homogeneity of physical equation, $s = ut + \frac{1}{2}at^2$ where u is the initial velocity, a is the acceleration, s is the displacement and t is the time in which the change occurs.
Tafsirkan kehomogenan persamaan fizik, $s = ut + \frac{1}{2}at^2$ di mana u ialah halaju awal, a ialah pecutan, s ialah sesaran dan t ialah masa di mana perubahan itu berlaku.

[6 marks]
[6 *markah*]

CLO2 ii. Based on Figure 1 (a) (ii), calculate the magnitude and direction of the resultant vector.
Berdasarkan Rajah 1 (a) (ii), hitungkan magnitud dan arah bagi vektor paduan.

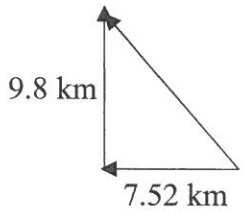


Figure 1 (a) (ii) / *Rajah 1 (a) (ii)*

[3 marks]
[3 *markah*]

CLO1 (b) i. Figure 1 (b) (i) shows the velocity-time graph represents the motion of a van. Describe the motion of the van at A, C and D.

Rajah 1 (b) (i) menunjukkan graf halaju-masa mewakili gerakan sebuah van. Terangkan pergerakan van di A, C dan D.

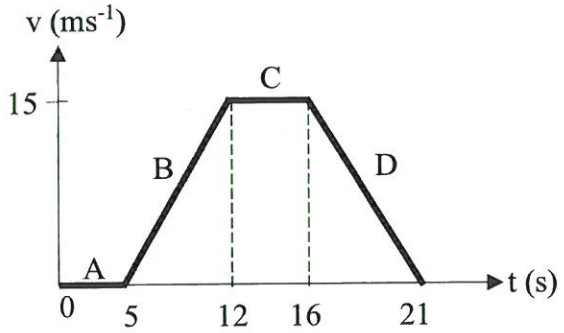


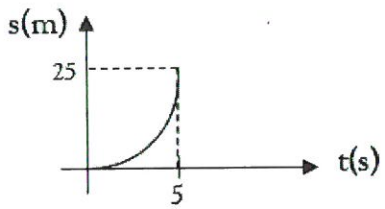
Figure 1 (b) (i) / *Rajah 1 (b) (i)*

[3 marks]

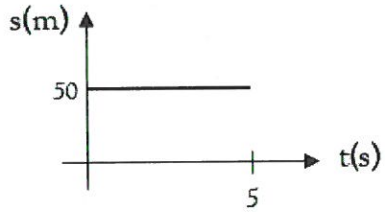
[*3 markah*]

CLO1 ii. Interpret the gradient trend exhibited by each of the displacement- time graphs shown by Graph A, Graph B, Graph C and Graph D.

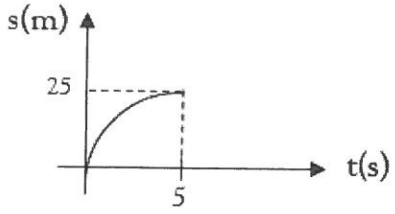
Tafsirkan arah aliran kecerunan yang ditunjukkan oleh setiap graf sesaran-masa yang ditunjukkan oleh Graf A, Graf B, Graf C dan Graf D.



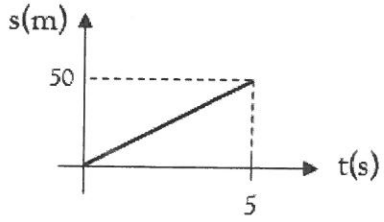
Graph A / Graf A



Graph B / Graf B



Graph C / Graf C



Graph D / Graf D

[4 marks]

[*4 markah*]

CLO2 (c) Figure 1 (c) shows a velocity-time graph of a motion along a straight line.
Rajah 1 (c) menunjukkan graf halaju-masa bagi suatu gerakan sepanjang garis lurus.

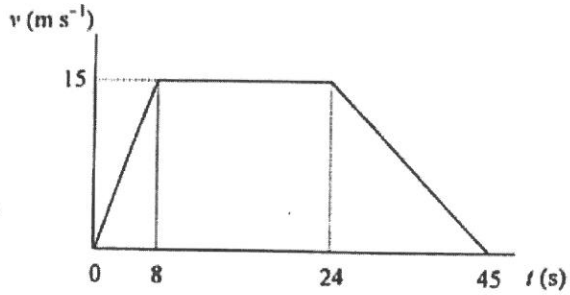


Figure 1 (c) / *Rajah 1 (c)*

i. Calculate the total displacement and average velocity of the entire motion.
Hitungkan jumlah sesaran dan halaju purata bagi keseluruhan gerakan itu.

[4 marks]

[4 *markah*]

ii. Sketch a graph of acceleration against time for the whole journey.
Lakarkan graf pecutan melawan masa untuk keseluruhan perjalanan.

[5 marks]

[5 *markah*]

QUESTION 2

SOALAN 2

CLO1 (a) i. State **THREE (3)** similarities and **ONE (1)** difference between kinetic energy and gravitational potential energy.

*Nyatakan **TIGA (3)** persamaan dan **SATU (1)** perbezaan antara tenaga kinetik dan tenaga keupayaan graviti.*

[5 marks]

[5 *markah*]

ii. By using a diagram, show the relationship between power and velocity in the form of equations.

Dengan menggunakan gambar rajah, tunjukkan hubungan antara kuasa dan halaju dalam bentuk persamaan.

[5 marks]

[5 *markah*]

CLO2 (b) An object of mass 2.0 kg is placed at the height of 30 cm directly above the top end of a vertical spring as shown in Figure 2 (b). Determine the maximum compression, x, experienced by the spring after the object hits the spring if given the spring constant, k = 2000 Nm^{-1}.

Satu objek berjisim 2.0 kg diletakkan pada ketinggian 30 cm tepat di atas spring tegak seperti yang ditunjukkan dalam Rajah 2 (b). Tentukan mampatan maksimum, x yang dialami oleh spring selepas objek menghentam spring jika pemalar spring, k = 2000 Nm^{-1}.

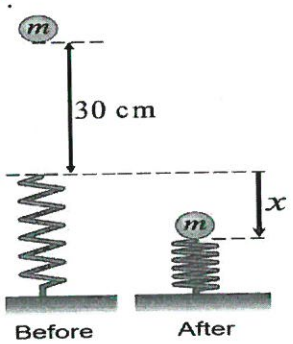


Figure 2 (b) / *Rajah 2 (b)*

[7 marks]

[7 *markah*]

CLO2 (c)

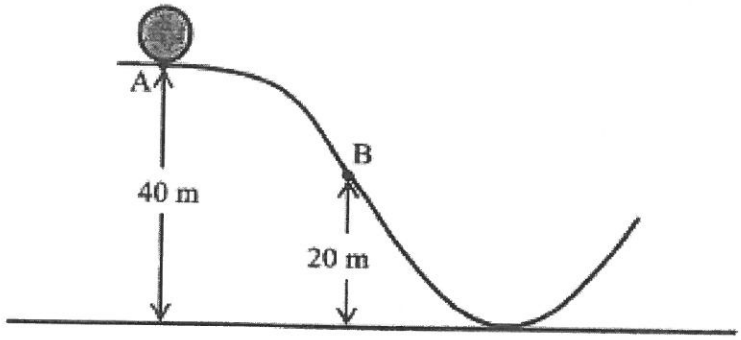


Figure 2 (c) / *Rajah 2 (c)*

A sphere of mass 4 kg initially at rest slides along a smooth and curvy surface as shown in Figure 2 (c). Calculate:

Sfera berjisim 4 kg pada mulanya dalam keadaan rehat meluncur di sepanjang permukaan licin dan melengkung seperti yang ditunjukkan dalam Rajah 2 (c). Kirakan:

i. The potential energy of the sphere at point A.
Tenaga keupayaan sfera pada titik A.

[2 marks]
[2 *markah*]

ii. The speed of the sphere as it passes point B.
Kelajuan sfera semasa ia melalui titik B.

[6 marks]
[6 *markah*]

QUESTION 3

SOALAN 3

CLO1 (a) i. Define instantaneous angular acceleration and average angular acceleration with their units.

Takrifkan pecutan sudut serta-merta dan purata pecutan sudut berserta unit.

[4 marks]

[*4 markah*]

ii. The angular position of a spinning top is given by $\theta = t^3 - 72t$ where t is in s and θ in radian. Show an expression for $\omega(t), \alpha(t)$ and the time taken for the top to stop.

Diberi kedudukan sudut gasing berputar $\theta = t^3 - 72t$ *di mana t adalah dalam s dan* θ *dalam radian. Tunjukkan ungkapan untuk* $\omega(t)$, $\alpha(t)$ *dan masa yang diambil untuk bahagian atas berhenti.*

[6 marks]

[*6 markah*]

CLO1 (b) Figure 3 (b) shows a ladder of negligible mass supporting a person weighing 55kg. If the contact point at A is frictionless and the contact point at B is rough, determine the forces acting at contact points A and B.

Rajah 3 (b) menunjukkan sebuah tangga yang jisimnya boleh diabaikan menyokong seseorang yang beratnya 55 kg. Jika titik sentuhan di A adalah tanpa geseran dan titik sentuhan di B adalah kasar, tentukan daya yang bertindak pada titik sentuhan A dan B.

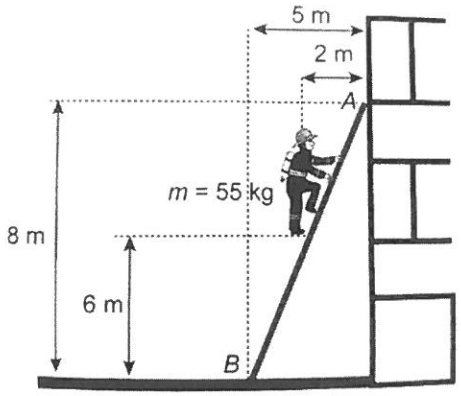


Figure 3 (b) / *Rajah 3 (b)*

[7 marks]
[*7 markah*]

CLO2 (c) Figure 3 (c) shows two particles about point O. Calculate:

Rajah 3 (c) menunjukkan dua zarah pada titik O. Kirakan:

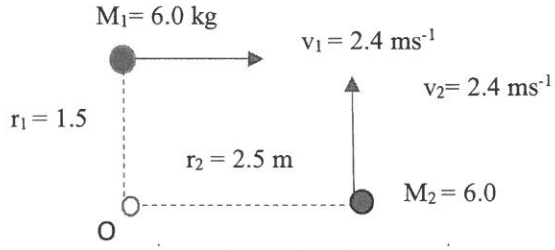


Figure 3 (c) / *Rajah 3 (c)*

i. angular momentum about point O for M_1 and M_2.
momentum sudut pada titik O untuk M_1 dan M_2.

[6 marks]
[6 *markah*]

ii. the total angular momentum
jumlah momentum sudut

[2 marks]
[2 *markah*]

QUESTION 4

SOALAN 4

CLO1 (a) i. A standing wave pattern consist of **Nodes (N)** and **Antinodes (A)**. Describe **Nodes (N)** and **Antinodes (A)**, then draw the waveform to show the **Nodes (N) and Antinodes (A).**

Corak gelombang berdiri terdiri daripada Nod (N) dan Antinod (A). Terangkan Nod (N) dan Antinod (A), kemudian lukiskan bentuk gelombang untuk menunjukkan Nod (N) dan Antinod (A).

[3 marks]

[*3 markah*]

ii. A progressive wave is represented by the equation $y(x,t) = 2\sin(4\pi t - 5\pi x)$, where y and x are in centimeters and t in seconds respectively. Show the wavelength and the frequency.

Gelombang progresif diwakili oleh persamaan $y(x,t) = 2\sin(4\pi t - 5\pi x)$, *di mana y dan x masing-masing dalam sentimeter dan t dalam saat. Tunjukkan panjang gelombang dan frekuensi.*

[4 marks]

[*4 markah*]

CLO2 (b) A stretch wire of length 80.0 cm and mass 12.0 g vibrates transversely. Waves travel along the wire at speed 200 ms^{-1}. Three antinodes can be found in the stationary waved formed in between the two fixed ends of wire.

Seutas dawai regangan sepanjang 80.0 cm dan berjisim 12.0 g bergetar melintang. Gelombang bergerak sepanjang wayar pada kelajuan 200 ms^{-1}. *Tiga antinod boleh didapati dalam gelombang pegun yang terbentuk di antara dua hujung wayar yang tetap.*

i. Sketch and label the waveform of the stationary wave.

Lakarkan dan labelkan bentuk gelombang pegun.

[2 marks]

[2 *markah*]

ii. Determine the wavelength of progressive wave which move along the wire.
Tentukan panjang gelombang progresif yang bergerak di sepanjang wayar.

[2 marks]
[2 *markah*]

iii. Calculate the frequency of the vibration of the wire
Kirakan frekuensi getaran wayar

[2 marks]
[2 *markah*]

iv. Calculate the tension of the wire
Kirakan tegangan wayar

[2 marks]
[*2 markah*]

(c) A bus approaches and passes a station at a constant speed 0f 10 ms^{-1} while sounding its horn which emits sound of frequency of 500 Hz. If the velocity of sound in air is 320 ms^{-1}. Determine:
Sebuah bas menghampiri dan melepasi stesen pada kelajuan malar 0f 10 ms^{-1} sambil membunyikan honnya yang mengeluarkan bunyi frekuensi 500 Hz. Jika halaju bunyi dalam udara ialah 320 ms^{-1}. Tentukan:

i. the frequency when the bus is approaching the station and the frequency when the bus moving away from the station
frekuensi apabila bas menghampiri stesen dan frekuensi apabila bas bergerak menjauhi stesen

[6 marks]
[6 *markah*]

ii. the change in frequency of the sound emitted by the horn as observed by a man standing at the station.

perubahan frekuensi bunyi yang dikeluarkan oleh hon seperti yang diperhatikan oleh seorang lelaki yang berdiri di stesen.

[4 marks]

[*4 markah*]

SOALAN TAMAT

FORMULA SHEET FOR PHYSICS 1 (FB10073)

Physical Quantities and Measurements	
$\vec{A} \cdot \vec{B} = AB\cos\theta$	$\vec{A} \times \vec{B} = AB\ \sin\theta$
Kinematics of Linear Motion	
$v = u + at$	$s = ut + \frac{1}{2}at^2$
$v^2 = u^2 + 2as$	$s = \frac{1}{2}(u + v)t$
$g = 9.81\ ms^{-2}$	
Dynamics of Linear Motion	
$p = mv$	$J = F\Delta t$
$J = \Delta p = mv - mu$	$f = \mu N$
Work, Energy and Power	
$w = mg$	$W = Fs$
$F = ma$	$P = Fv$
$W = Fs\ \cos\theta$	$P = \frac{\Delta E}{\Delta t}$
$P = \frac{W}{t} = \frac{\Delta E}{\Delta t}$	$K = \frac{1}{2}mv^2$
$\eta = \frac{P_{out}}{P_{in}} \times 100\%$	$U = mgh$
$W_{total} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$	$U_s = \frac{1}{2}kx^2 = \frac{1}{2}Fx$
$W = U_f - U_i$	$F = kx$
$E = K + U$	
Circular Motion	
$s = r\theta$	$v = r\omega$
$f = \frac{1}{T}$	$\omega = \frac{\Delta\theta}{\Delta t}$
$\omega = \frac{2\pi}{T} = 2\pi f$	$a_c = \frac{v^2}{r} = r\omega^2 = v\omega$

$F_c = \frac{mv^2}{r} = mr\omega^2 = mv\omega$	
Rotation of Rigid Body	
$v = r\omega$	$s = r\theta$
$\alpha = \frac{\Delta\omega}{\Delta t}$	$a_t = r\alpha$
$\tau = F \times r$	$\omega = \omega_0 + \alpha t$
$\tau = rF\sin\theta$	$\theta = \omega_0 + \frac{1}{2}\alpha t^2$
$I = \sum mr^2$	$\omega^2 = {\omega_0}^2 + 2\alpha\theta$
$I = mr^2\alpha$	$\theta = \frac{1}{2}(\omega_0 + \omega)t$
$\tau = I\alpha$	$I_{ring} = MR^2$
$P = \tau\omega$	$I_{disc/\ solid\ cylinder} = \frac{1}{2}MR^2$
$L = I\omega$	$I_{solid\ sphere} = \frac{2}{5}MR^2$
$K = \frac{1}{2}I\omega^2$	$I_{hollow\ sphere} = \frac{2}{3}MR^2$
$W = \tau\theta$	$I_{rod} = \frac{1}{12}ML^2$
$K = \frac{1}{2}m\omega^2(A^2 - x^2)$	
Oscillations and Waves	
$x = A\sin\omega t$	$\frac{d(sinx)}{dt} = cosx\ ;\quad \frac{d(\cos x)}{dt} = -sin\ x$
$v = \frac{dy}{dt} = \omega A\cos\omega t\ = \pm\omega\sqrt{A^2 - x^2}$	$a = \frac{dv}{dt} = \frac{d^2x}{dt^2} = -A\omega^2 Sin\ \omega t = -\omega^2 x$
$y(x,t) = A\sin(\omega t \pm kx)$	$y = A\cos kx\sin\omega t$
$v_y = A\omega\cos(\omega t \pm kx)$	$v = \sqrt{\frac{T}{\mu}}$
$v = \omega A$	$F = kx$
$\omega = 2\pi f$	$E = \frac{1}{2}m\omega^2 A^2$

$a = -\omega^2 x$	$U = \frac{1}{2} m\omega^2 x^2$
$f_n = \frac{nv}{2L}$	$f = \frac{1}{T}$
$f_n = \frac{n}{2L}\sqrt{\frac{T}{\mu}}$	$v = f\lambda$
$k = \frac{2\pi}{\lambda}$	$T = 2\pi\sqrt{\frac{l}{g}}$; $T = 2\pi\sqrt{\frac{m}{k}}$
$\mu = \frac{m}{l}$	$f_a = \left(\frac{v \pm v_o}{v \mp v_s}\right) f$