Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	PHYSICS I
COURSE CODE	:	DAS 14103
PROGRAMME CODE	:	DAU
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS IN SECTION A AND **TWO (2)** QUESTIONS IN SECTION B

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

SECTION A

Q1 (a) State the work-energy theorem.

(2 marks)

(b) The **Figure Q1 (b)** shows a baker pushing a rolling pin of mass 0.50 kg with a constant velocity on a table. The table surface is sprinkled with flour to reduce the coefficient of kinetic friction to 0.13.

(i) Draw FBD by showing all the forces acting on the rolling pin.

(2 marks)

(ii) Compute the force, F exerted by the baker.

(5 marks)

(iii) Calculate the work done by the baker when the rolling pin is pushed through 20 cm.

(2 marks)

(c) The displacement of an oscillating object as a function of time is shown in **Figure Q1 (c)**. Determine:

(i) the amplitude, period, frequency and angular frequency.

(6 marks)

(ii) the equation of displacement, x as a function of time, t.

(2 marks)

(iii) the equation of velocity, v as a function of time, t.

(3 marks)

(iv) the equation of acceleration, a as a function of time, t.

(3 marks)

Q2 (a) (i) Name **two (2)** types of mechanical waves.

(2 marks)

(ii) State a difference between the two types of the mechanical waves.

(4 marks)

(iii) Give an examples for each.

(2 marks)

(b) A progressive wave is represented by the equation

$$y\,(x,t) = 5\sin\frac{\pi}{2}\,t + \frac{\pi}{3}\,x$$

Where x and y are in meters and t is in seconds. Determine the amplitude, angular frequency, the wavelength and the period.

(6 marks)

(c) At $t = 0$ and $x = 0$, a progressive wave with a velocity of 340 ms^{-1}, amplitude of 0.20 m and frequency of 450 Hz is propagating to the right.

(i) Calculate the wavelength of the wave.

(2 marks)

(ii) Write a wave equation of the wave.

(9 marks)

SECTION B

Q3 (a) State **three (3)** equations of Newton's Law of motion.

(3 marks)

(b) Two objects are connected by a light string that passes over a frictionless pulley, as in **Figure Q3 (b).** If the incline plane is frictionless and if $m_1 = 2.00$ kg, $m_2 = 6.00$ kg, and $\theta = 58.5°$.

(i) Draw a FBD of both objects.

(4 marks)

(ii) Calculate the acceleration of the objects.

(8 marks)

(iii) Calculate the tension of the string

(3 marks)

(iv) If there is a frictional force of 10 N acting on a m_2, calculate the acceleration of the system.

(7 marks)

Q4 (a) Define rotational motion.

(2 mark)

(b) Differentiate between tangential acceleration and centripetal acceleration.

(4 marks)

(c) A blade of a giant ceiling fan at UTHM mosque has a radius of 200 cm. The blade is rotating with an initial angular velocity of 0.75 $revs^{-1}$. The angular acceleration of the blade is 1.50 $revs^{-2}$. Determine:

(i) the angular velocity after 5s.

(7 marks)

(ii) the number of revolutions made by the blade in this time interval.

(4 marks)

(iii) the speed of a point on the tip of the blade at time t = 5s.

(2 marks)

(iv) the acceleration of a point on the tip of the blade at time t = 5s.

(2 marks)

(v) the centripetal acceleration of a point on the tip of the blade at time t = 5s.

(2 marks)

(vi) the resultant acceleration of a point on the tip of the blade at t = 5s.

(2 marks)

Q5 (a) Name **two (2)** basic quantities.

(2 marks)

(b) Convert 85 mih^{-1} to kms^{-1}. Given 1 mi = 1609 m.

(3 marks)

(c) The energy stored in a wire, W in unit Joule (kgm^2s^{-2}) of cross sectional area, A when it is stretched is given by:

$$W = \frac{EAx^2}{2l}$$

(i) Determine the dimension for the Young Modulus, E.

(4 marks)

(ii) State the SI unit for E.

(1 mark)

(d) Given A = 5m < 15°, B = 10 m bearing 200°, C = 15m N 20° W and D = 20 m < -40°. Calculate the magnitude and direction of vector E if E = A+B+C+D.

(10 marks)

(e) A projectile is shot horizontally at 23.40 ms^{-1} from the edge of a 55 m building. Calculate the height of the projectile from the ground after 2s.

(5 marks)

-END OF QUESTIONS-

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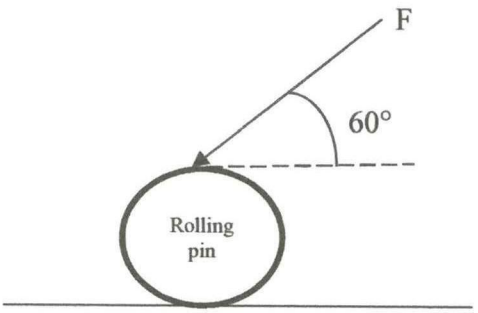

Figure Q1 (b)

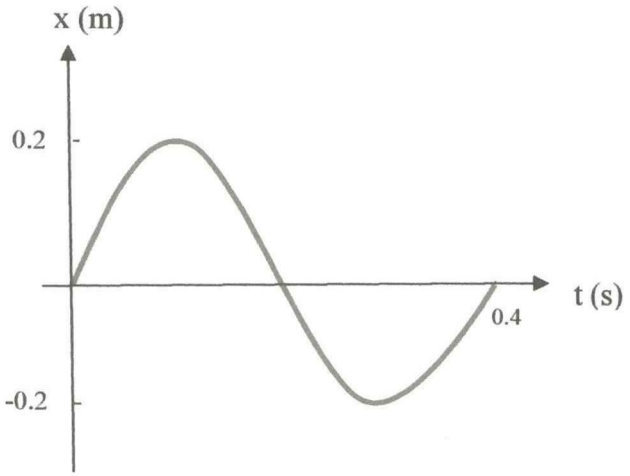

Figure Q1 (c)

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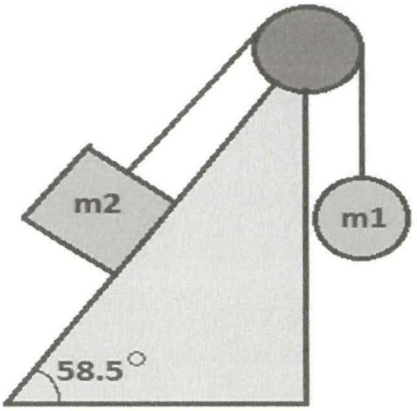

Figure Q3 (b)

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LIST OF FORMULA

$v = u + a\ t$

$s = ut + \frac{1}{2}at^2$

$v^2 = u^2 + 2as$

$\vec{a} = \frac{\sum \vec{F}}{m} = \frac{\vec{F}_{net}}{m}$

$T_K = T_C + 273.15$

$a_c = \frac{v^2}{r}$

$T_C = \frac{T_F - 32}{1.8}$

$\vec{p} = m\vec{v}$

$K = \frac{1}{2}mv^2$

$\Delta E = W = F_{\parallel} = Fs\cos\theta$

$\omega = \omega_0 + \alpha t$

$U_s = \frac{1}{2}kx^2\sqrt{\frac{Y}{\rho}}$

$F_b = \rho g V$

$\rho = \frac{m}{V}$

$s = \frac{1}{2}(u + v)t$

$\theta = \frac{s}{r}$

$\omega = \frac{\Delta\theta}{\Delta t}$

$\alpha = \frac{\Delta\omega}{\Delta t}$

$a_{tan} = r\alpha$

$a_R = \frac{v^2}{r}$

$c = \sqrt{x^2 + y^2}$

$tan\theta = \frac{y}{x}$

$F_c = \frac{mv^2}{r}$

$v = r\omega$

$T = \frac{2\pi}{\omega}$

$\omega = 2\pi f$

$F = ma$

$a = \sqrt{a_R{}^2 + a_{tan}{}^2}$