Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	PHYSICS
COURSE CODE	:	DAM 13202
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTIONS	:	1. ANSWER **ALL** QUESTIONS
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.**
		3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

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

Q1 (a) Determine the number of significant figures for the following:

(i) 9.026 (1 mark)

(ii) 0.0029 (1 mark)

(iii) 54.00 (1 mark)

(iv) 0.00800 (1 mark)

(v) 835 (1 mark)

(b) Define the following terms:

(i) Significant figures. (1 mark)

(ii) Prefix. (1 mark)

(c) The age of the earth is thought to be about 4.6 billion years. Assuming three significant figures, write the answer in prefixes:

(i) Years (3 marks)

(ii) Seconds (3 marks)

(d) A van is driven to South for a distance of $35x10^3$m, then to the East for $1.9685\ x10^6$ inch and finally in the direction 60□ East of North for 14 km.

(i) Sketch and label of the displacement from its starting point. (4 marks)

(ii) Analyze the magnitude of the displacement in km from its starting point. (4 marks)

(iii) Calculate the angle of the displacement from its starting point. (4 marks)

Q2 (a) A ball is kicked at an angle of 30° with the ground as shown in **Figure Q2(a)**.

(i) Analyze the initial velocity of the ball so that it hits a target that is 28 meters away at a height of 1.6 meters.

(14 marks)

(ii) Calculate the time taken for the ball to reach the target.

(2 marks)

(b) A car starting from rest has an acceleration of 3.2 ms^{-2}. After the car has travelled 150 m, it slows down with an acceleration of 2.10 ms^{-2} until its velocity is 20 ms^{-1}.

(i) Sketch and label the statement into a time line of the situation.

(3 marks)

(ii) Calculate the car's velocity just before is slows down.

(3 marks)

(iii) Determine the total displacement of the car.

(3 marks)

Q3 (a) An inclined plane makes an angle of 25 with the horizontal ground. A 30 kg block on inclined plane is connected to a freely hanging 20 kg ball by a string passing over a frictionless pulley as shown in **Figure Q3(a)**.

(i) Sketch the Free Body Diagram of this situation.

(3 marks)

(ii) Define the term of Free Body Diagram.

(2 marks)

(iii) Calculate the distance the 20 kg ball will fall in 2 s starting from rest. Neglect all the frictional forces.

(7 marks)

(b) A lorry is travelling with a velocity of 50 ms^{-1} on the karak Highway. The wheels of the lorry have a diameter of 90 cm. If the lorry then speed up with an acceleration of 10 ms^{-2} for 5 s. Determine.

(i) The number of revolution of the wheel.

(4 marks)

(ii) The angular velocity of the wheel at 5 s.

(4 marks)

(c) A cord is wrapped around a wheel of diameter 1 m. If the cord is pulled down 20 cm, as shown in **Figure Q3(c)**. Compute the revolutions has the wheel rotated.

(5 marks)

Q4 (a) A 200 kg steel ball 55 m above the bottom of a dip starting to roll from rest at a point A. If track AB has a smooth surface, while track BC has a rough surface and the speed of the ball at point C is 22 ms^{-1} as shown in **Figure Q4(a)**.

(i) Determine the speed of the ball at point B.

(3 marks)

(ii) Compute the amount of energy between track BC.

(3 marks)

(iii) Define the work-energy theorem.

(2 marks)

(b) A spring stretches 0.150m when a 0.3 kg mass is gently attached to it as in **Figure Q4(b)(i)**. The spring is then set up horizontally with the 0.3 kg mass resting on a frictionless table as in **Figure Q4(b)(ii)**. The mass is pushed so that the spring is compressed 0.1 m from the equilibrium point, and released from rest. Determine the following:

(i) The spring stiffness constant k and angular frequency, ω

(4 marks)

(ii) The amplitude of the horizontal oscillation, A

(1 mark)

(iii) The magnitude of the maximum velocity, v_{max}

(2 marks)

(iv) The magnitude of the maximum acceleration, a_{max} of the mass

(2 marks)

(v) The period T and the frequency f

(3 marks)

(vi) The displacement x as a function of time

(1 mark)

(vii) The velocity at $t = 0.15$ s

(4 marks)

-END OF QUESTIONS –

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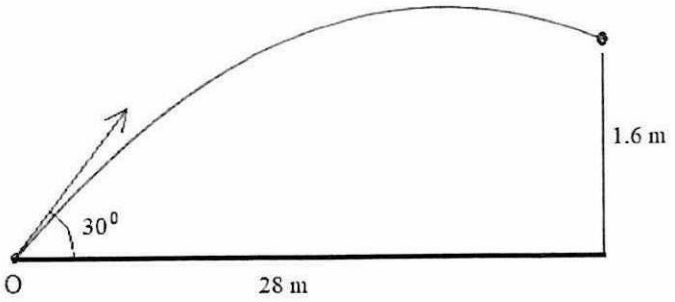

Figure Q2(a)

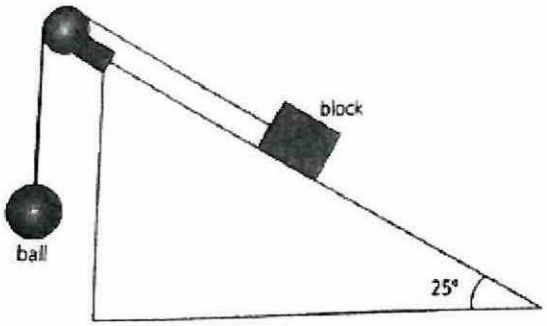

Figure Q3(a)

Cord (pulled down 20 cm)

Figure Q3(c)

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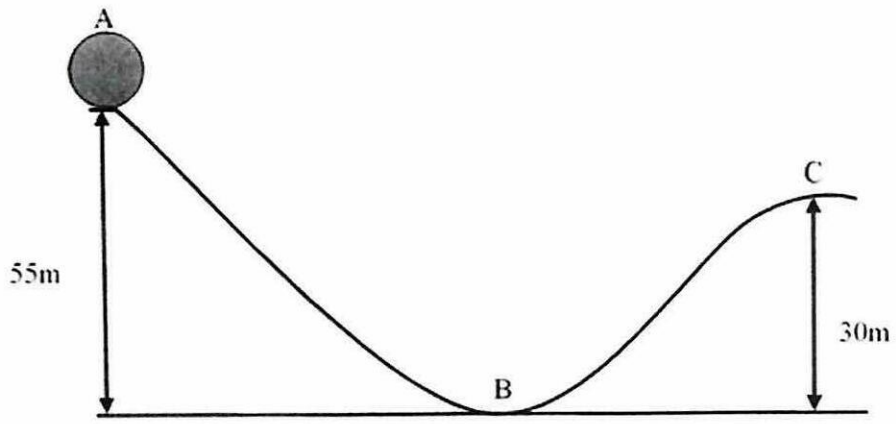

Figure Q4(a)

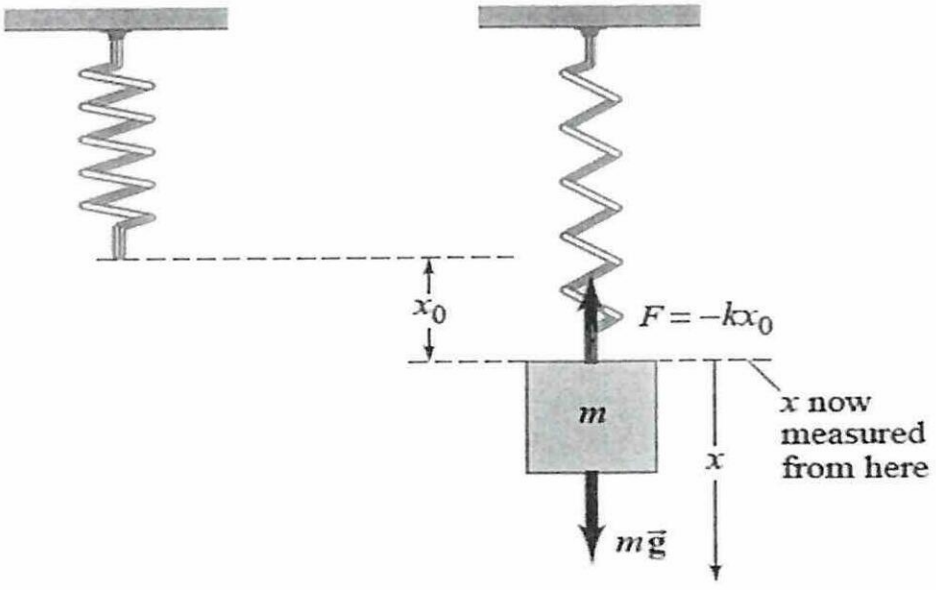

Figure Q4(b)(i)

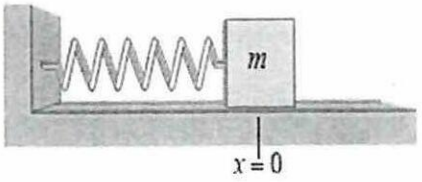

Figure Q4(b)(ii)

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LIST OF FORMULA

Gravity acceleration, $g = 9.81\ m/s^2$	$V_{sphere} = \frac{4}{3}\pi r^3$	$Fb = \rho g V$
$W = F \cdot s = Fs\cos\theta$	$E_u = \frac{1}{2}kx^2 = \frac{1}{2}m\omega^2 x^2$	$s = r\theta$
$K = \frac{1}{2}mv^2$	$E_J = E_k + E_u = \frac{1}{2}m\omega^2 A^2$	$v = r\omega$
$U = mgh$	$R = \sqrt{R_x^2 + R_y^2}$	$a = r\alpha$
$\Delta K = -\Delta U$	$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right)$	$\omega = \frac{d\theta}{dt}$
$W_n = \Delta K$	$v = u + at$	$\alpha = \frac{d\omega}{dt}$
$\frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = -(mgh_2 - mgh_1)$	$s = ut + \frac{1}{2}at^2$	$a_c = \frac{v^2}{r} = \omega^2 r$
$a = -\omega^2 \cdot x$	$v^2 = u^2 + 2as$	$a = r\sqrt{\omega^4 + \alpha^2}$
$f = \frac{1}{T} = \frac{\omega}{2\pi}$	$\sum F = ma$	$\omega = \omega_o + \alpha t$
$v = \omega\sqrt{A^2 - x^2}$	$W = mg$	$\theta = \omega_o t + \frac{1}{2}\alpha \cdot t^2$
$E_k = \frac{1}{2}mv^2 = \frac{1}{2}m\omega^2(A^2 - x^2)$	$f_k = \mu_k \cdot N;\ f_s = \mu_s \cdot N$	$\omega^2 = \omega_o^2 + 2\alpha \cdot \Delta\theta$