Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	PHYSICS
COURSE CODE	:	DAM 13202
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	JANUARY / FEBRUARY 2022
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTIONS	:	1. ANSWER **ALL** QUESTIONS\
		2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSE** BOOK.

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

Q1 (a) State the Newton's first law and state its **TWO (2)** examples.

(4 marks)

(b) A 70-kg box is pulled by a 400 N force at an angle of 30° to the horizontal as shown in **Figure Q1 (b)**. The coefficient of kinetic friction is 0.50. Determine the acceleration of the box.

(8 marks)

(c) A cord passing over an easily turned pulley (one that is both massless and frictionless) has a 7.0 kg mass hanging from one end and 9.0 kg mass hanging from the other, as shown in **Figure Q1 (c)**.

(i) Draw a free-body diagram (FBD) for the forces acting on both masses.

(4 marks)

(ii) Calculate the acceleration on the system.

(6 marks)

(iii) Calculate the tension on the string.

(3 marks)

Q2 (a) Define angular displacement and angular velocity.

(4 marks)

(b) A fan turns at a rate 900 rpm (rev/min).

(i) Find the angular speed of any point on one of the fan blade in unit rad/s.

(5 marks)

(ii) Find the tangential speed of the tip of a blade if the distance from the center to the tip is 20.0 cm.

(5 marks)

(c) A flywheel turned initially at angular speed 1.5 rad/s through 40 rev, then come to stop. By assuming the flywheel undergoes constant acceleration,

(i) Find time for flywheel to stop completely

(3 marks)

(ii) Determine angular acceleration

(4 marks)

(iii) Calculate time required to complete 20 revolution.

(4 marks)

Q3 (a) Define work.

(3 marks)

(b) **Figure Q3 (b)** shows a 100g of ball sliding from a hill. If friction forces are negligible and the ball has a speed of 200 cm/s initially at point **A**.

(i) Find what will be its speed at point **B**.

(3 marks)

(ii) Calculate its speed at point **C**.

(3 marks)

(iii) Calculate its potential energy at point **A**.

(3 marks)

(iv) Determine the change of potential energy from point **B** to **C.**

(3 marks)

(c) The only force acting on a 5.0 kg object has components $F_x = 20$ N and $F_y = 30$ N.

(i) Calculate the acceleration of the object on x-axis.

(4 marks)

(ii) Calculate the acceleration of the object on y-axis.

(3 marks)

(iii) Calculate the resultant acceleration and its angle.

(3 marks)

Q4 (a) Two metal sphere were suspended by chord as shown in Figure Q4(a). Sphere 1 m1=30 g and were pulled until reaching height h1=8.0 cm, then released from rest. After swinging down, it undergoes elastic collision with sphere 2 that has mass m2=75 g.

(i) Explain elastic collision in term of kinetic energy changes

(2 mark)

(ii) Find the velocity of sphere 1 just before the collision

(4 marks)

(iii) Determine the velocity of sphere 1 after collision

(4 marks)

(b) A car with mass 900 kg moves at a speed of 25 $m.s^{-1}$ through a curved road with a radius 500 m as shown in **Figure Q4 (b).**

(i) Draw free body diagram acting on the car

(2 marks)

(ii) Calculate the magnitude of the centripetal acceleration of a car following a curve of radius

(4 marks)

(iii) Calculate the centripetal force exerted by the car

(4 marks)

(iv) Determine is the minimum coefficient of static friction between the tyres and the road (static friction being the reason that keep the car from slipping).

(5 marks)

– END OF QUESTIONS

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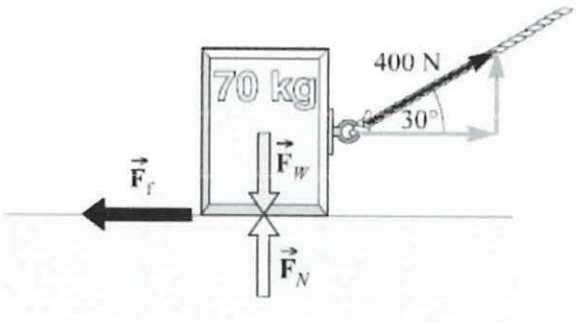

Figure Q1 (b)

Figure Q1 (c)

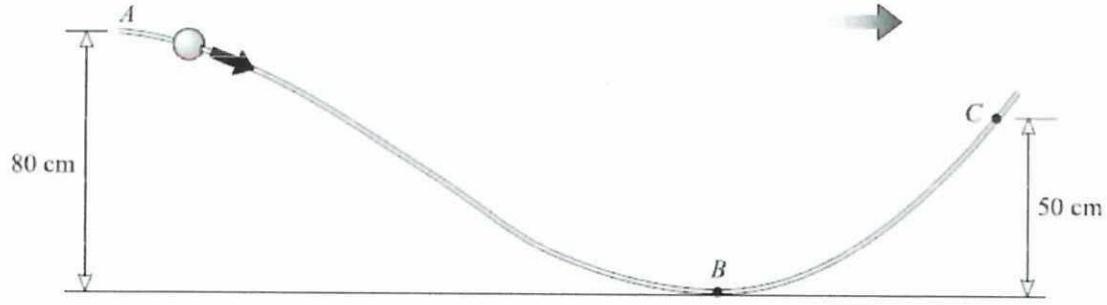

Figure Q3 (b)

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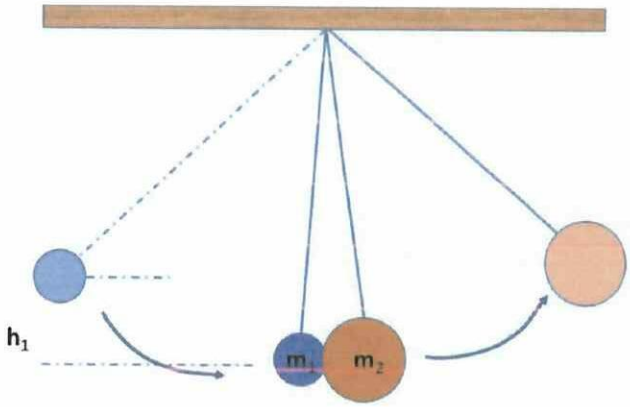

Figure Q4 (a)

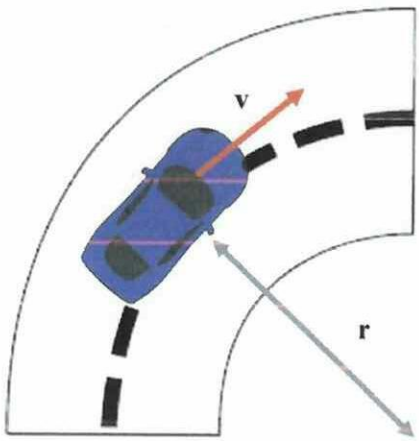

Figure Q4 (b)

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LIST OF FORMULA

$v_x = v_{0x} + a_x t$

$x = x_0 + v_{x0}t + \frac{1}{2}a_x t^2$

$v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$

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

$T_K = T_C + 273.15$

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

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

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

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

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

$\omega = \omega_0 + \alpha t$

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

$m_1v_1 + m_2v_2 = (m_1v_1)' + (m_2m_2)'$

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

$\omega = \omega_o + \alpha t$

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

$a_T = \alpha \cdot r$

$v_T = \omega \cdot r$

$\omega = 2\pi f$

$x = A\cos(\omega t)$

$F = ma$

$\Delta\theta = \theta_f - \theta_i$

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

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

$v = \omega r$

$T = \frac{2\pi r}{v}$

$a_c = \omega^2 r$

$E = K + U$

$P = Fv$

$\omega^2 = \frac{k}{m}$

$v = \omega A$

$PE = \frac{1}{2}kx^2$