Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	PHYSICS 1
COURSE CODE	:	DAS 14103
PROGRAMME	:	3 DAE / 3 DAM
EXAMINATION DATE	:	JUNE / JULY 2016
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	**SECTION A**: ANSWER ALL QUESTIONS **SECTION B:** ANSWER **TWO (2)** QUESTIONS ONLY IN

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

SECTION A

Q1 (a) Define the principle of Hooke's law.

(04 marks)

(b) A 200g block connected to a light spring for which the force constant is 5N/m is free to oscillate on a horizontal, frictionless surface. The block is displaced 5cm from equilibrium and released from rest, as in **Figure Q1 (b)**.

(i) Determine the period of its motion.

(ii) Determine the maximum speed of the block.

(iii) Determine the maximum acceleration of the block.

(iv) Express the position, speed, and acceleration as functions of time.

(21 marks)

Q2 (a) Define the instantaneous power.

(04 marks)

(b) A 4kg particle moves along the x axis. Its position varies with time according to $x = t + 2.0t^3$, where x is in meters and t is in seconds. Calculate the following:

(i) The kinetic energy as function of time, t.

(ii) The acceleration of the particle and the force acting on it at time, t.

(iii) The power being delivered to the particle at time, t.

(iv) The work done on the particle in the interval t = 0 to t = 2s.

(21 marks)

SECTION B

Q3 (a) A sphere with it radius is 400mm is float in density of oil 0.78g/cm^3 under gravity.

(i) Convert the density of oil in SI unit.

(ii) Determine the buoyancy force of the sphere in SI unit.

(08 marks)

(b) A pack of five wolves are fighting over the carcass of a dead polar bear. A top view the magnitude and direction of the three forces are shown in **Figure Q3 (b).**

(i) Calculate the force along horizontal motion.

(ii) Calculate the force along vertical motion.

(iii) Determine the net force acting upon the carcass.

(iv) Determine the direction of the net force acting upon the carcass.

(v) Calculate the acceleration of the 750kg polar bear carcass.

(17 marks)

Q4 (a) Discuss the concept of projectile at horizontal and vertical component.

(06 marks)

(b) In **Figure Q4 (b)** a rescue plane flies at 198km/h and constant height h = 500m toward a point directly over a victim, where a rescue capsule is to land.

(i) Calculate the time taken by a rescue capsule is to land.

(ii) Determine the angle of the pilot's line of sight to the victim when the rescue capsule release is made.

(iii) Determine the velocity in unit-vector notation as the rescue capsule reaches the water.

(19 marks)

Q5 (a) Differentiate three types of Newton's law.

(09 marks)

(b) Two objects are connected by a light string that passes over a frictionless pulley, as in **Figure Q5 (b)**. If the incline is frictionless and if $m_1 = 2kg$, $m_2 = 6kg$, and $\theta=55°$.

(i) Draw free body diagrams of both objects.

(ii) Determine the acceleration of the objects.

(iii) Calculate the tension of the string.

(iv) Analyze the speed of each object 2s after being released from rest.

(16 marks)

Q6 (a) Define the following term and state it SI unit:

(i) Angular acceleration.

(ii) Tangential acceleration.

(iii) Centripetal acceleration.

(09 marks)

(b) Derive the relationship of the tangential and centripetal accelerations.

(04 marks)

(c) A 90cm radius roulette wheel is initially turning at 3rev/s then slow down uniformly and finally stop after turning 26revolutions. Determine the following:

(i) Time taken for the wheel to stop.

(ii) Angular acceleration of the wheel.

(iii) Initial tangential speed of the wheel.

(iv) Initial centripetal acceleration of the wheel.

(12 marks)

- END OF QUESTIONS –

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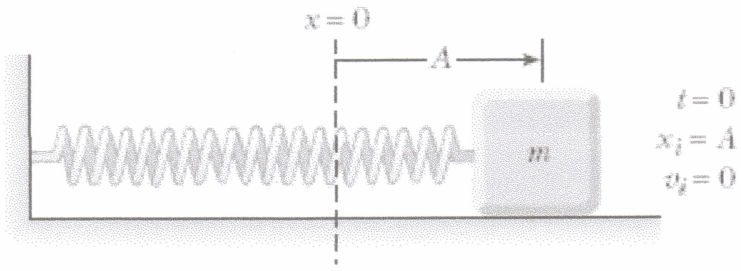

Figure Q1 (b)

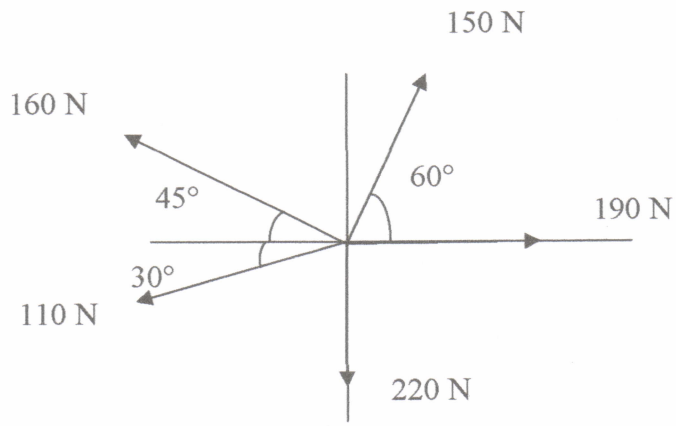

Figure Q3 (b)

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COURSE	: PHYSICS 1	COURSE CODE	: DAS 14103

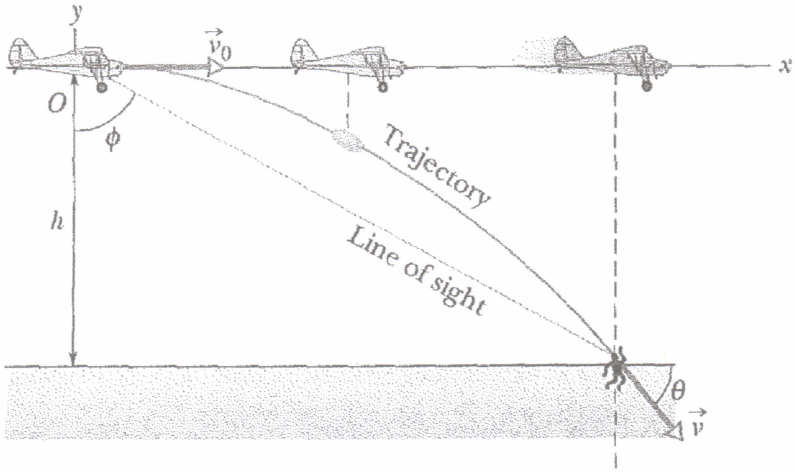

Figure Q4 (b)

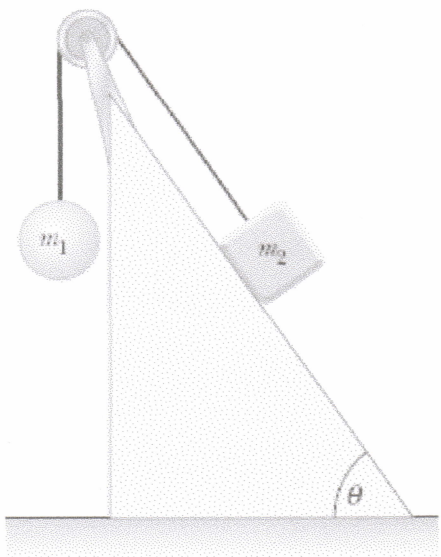

Figure Q5 (b)

FORMULAE

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