Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	PHYSICS FOR ENGINEERING TECHNOLOGY
COURSE CODE	:	BWM 12603
PROGRAMME	:	1 BWM
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	3 HOURS
INSTRUCTION	:	A) ANSWER **ALL** QUESTIONS IN SECTION A B) ANSWER **THREE (3)** QUESTIONS IN SECTION B

THIS QUESTION PAPER CONSISTS OF **11** PAGES

SECTION A

Q1 (a) A supertanker has mass 2.0×10^6 kg submerged 9.0 m when it is empty. The ship can carry the maximum load of 3.0×10^6 kg. Determine the minimum water depth of the ship when it carries the maximum load. Assume the sides of the ship are vertical. The density of sea water is 1030 kgm^{-3}.

(10 marks)

(b) An open U - shaped tube is partially filled with water and liquid, F which does not mixed with water as shown in Figure **Q1(b)**. The density of water is 1000 kgm^{-3}. Determine

(i) The gauge pressure and absolute pressure at point A.

(5 marks)

(ii) The density of liquid F.

(5 marks)

Q2 (a) Four forces act on cupboard with dimension (4 x 8) m as shown in the Figure **Q2(a).** If $F_1 = 4N$, $F_2 = 6N$, $F_3 = 9N$ and $F_4 = 10N$, find the moment

(i) at point A

(5 marks)

(ii) at point O.

(5 marks)

(b) A block of mass $m_1 = 50$ g on a rough, horizontal surface is connected to a ball of mass $m_2 = 5g$ by a lightweight cord over a light frictionless pulley, as shown in Figure **Q2(b)**. A force F of a magnitude 10 N at an angle $\theta = 60^0$ with horizontal is applied to the block m_1. The coefficient of kinetic friction between the block and the surface is $\mu_k = 0.15$.

(i) Draw the free body diagram, FBD for each mass

(2 marks)

(ii) Determine the magnitude of the acceleration of two objects

(4 marks)

(iii) Determine the tension of the cord.

(4 marks)

SECTION B

Q3 (a) A 200 N force pushes on 15 kg box on horizontal floor with friction force of 50 N as shown in Figure **Q3(a)**. The block move at a distance $s = 5.0$ m. Determine the work done by

(i) force due the gravity.

(3 marks)

(ii) friction force.

(3 marks)

(iii) external force 200 N.

(2 marks)

(iv) net force of the system.

(2 marks)

(b) A 12.0 kg block is released from point A in the Figure **Q3(b)**. The track from point A to B is frictionless and B to C having friction. The block is moving down the track and stop at point C. If the coefficient of kinetic friction at BC is 0.2 determine

(i) the velocity at point B

(5 marks)

(ii) the distance d from point B to C.

(5 marks)

Q 4 (a) A wall of a freezing plant is composed of 9 cm of cork board and 18 cm of solid concrete as shown in Figure **Q4(a)**. The inside surface is at -20^0C and the outside surface is 27^0C.

(i) What is the interface temperature t_i

(5 marks)

(ii) Determine the heat floe per unit area

(5 marks)

(b) A highway is made of concrete slabs that are 15 m long at 20.0 °C.

(i) If the temperature range at the location of the highway is from -20.0 °C to +40.0 °C, what size expansion gap should be left (at 20.0 °C to prevent bucking of the highway?

(5 marks)

(ii) How large is the gap at -20.0 °C.

(5 marks)

Q5 (a) The speed of sound v in a gas at pressure P and density ρ is given by the formula

$$v = \sqrt{\frac{YP}{\rho}}$$

what is the unit of Y, if any.

(3 marks)

(b) A property estate advertises a commercial building space for sale. The price for 1 square feet is 300 US dollar.

(i) Express the price in Malaysia Ringgit for 1 square meter floor area.

(4 marks)

(ii) Determine the price of one lot space with an area of 1000 square feet.

(4 marks)

State the final answers to the correct significant figures. Given 1 US Dollar = MYR 3.21 and 1 in = 2.54 cm.

(c) A system of coplanar forces in static equilibrium is shown in Figure **Q5(c)**.

(i) Draw a triangle of forces for all the forces

(3 marks)

(ii) Determine forces T and P.

(6 marks)

Q6 (a) (i) What is meant by elastic deformation and plastic deformation?

(2 marks)

(iii) Define shear modulus of elasticity.

(2 marks)

(b) Young modulus of steel is three times greater than that for aluminum. If they are identical in other factors, such as their dimension, determine the ratio of their elongation when both of them are applied with equal stress.

(7 marks)

(c) Copper has an elastic limit of 2.0×10^8 Pa and tensile strength of 4.0×10^8 Pa.

(i) Explain the meaning of elastic limit of cupper is 2.0×10^8 Pa.

(3 marks)

(ii) A tensile strength of cupper is 4.0×10^8 Pa. What is the maximum load that could be suspended from a copper wire of length 1.0 m and radius of 1.0 mm without breaking?

(6 marks)

Q7 (a) The displacement of a wave is given according to

$$Y = 0.26 \sin (\pi t - 3.7\pi x) \text{ m}$$

Where t in seconds an x is in meters.

(i) What is the direction of the wave?

(2 marks)

(ii) What is the amplitude of the wave?

(2 marks)

(iii) What is the frequency of the wave?

(3 marks)

(iv) What is the velocity of the wave?

(3 marks)

(b) A wire of mass 40.0 g is stretched so that it ends are tied down at points 80.0 cm a part. The wire vibrates in its fundamental mode with frequency 60 Hz.
Determine

(i) The speed of propagation of the wave through the wire
(5 marks)

(ii) The tension of the wire.
(5 marks)

-END OF QUESTION-

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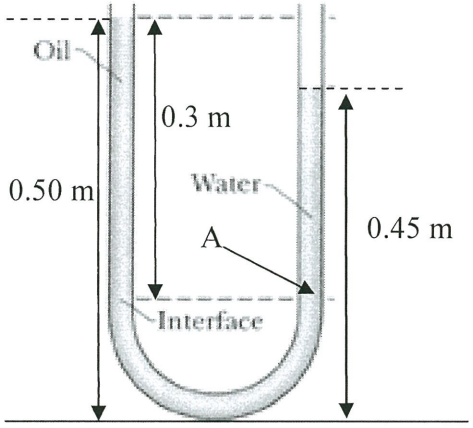

FIGURE Q1(b)

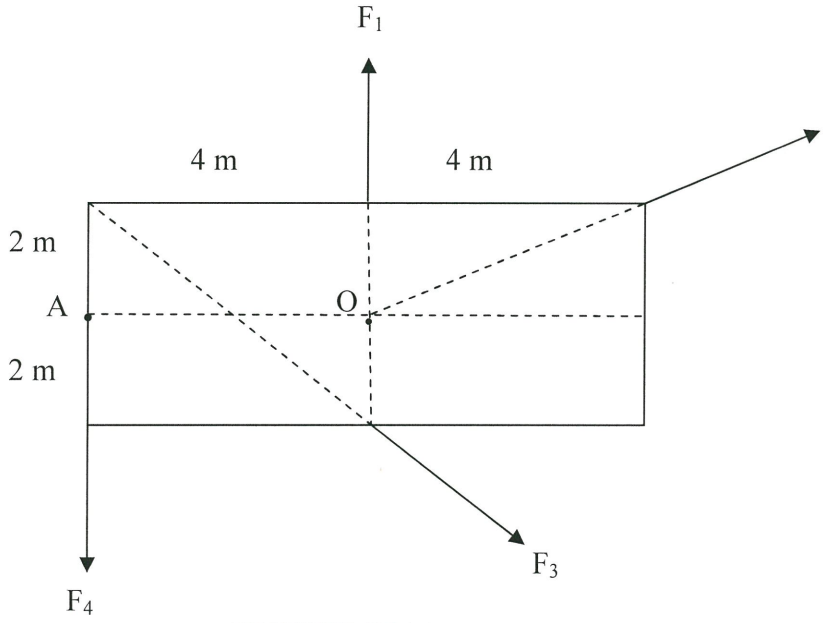

FIGURE Q2(a)

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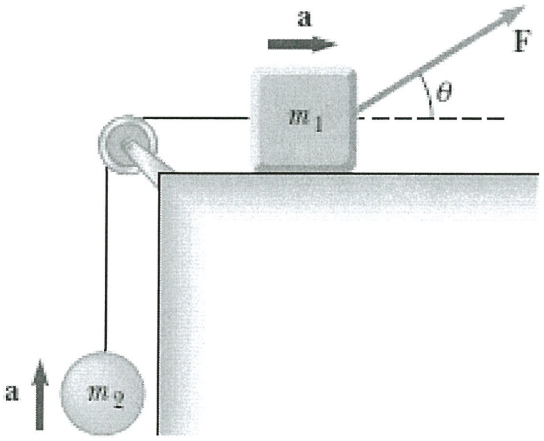

FIGURE Q2(b)

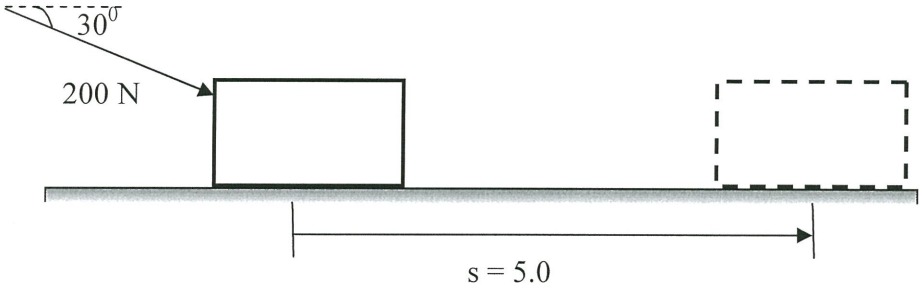

FIGURE Q3(a)

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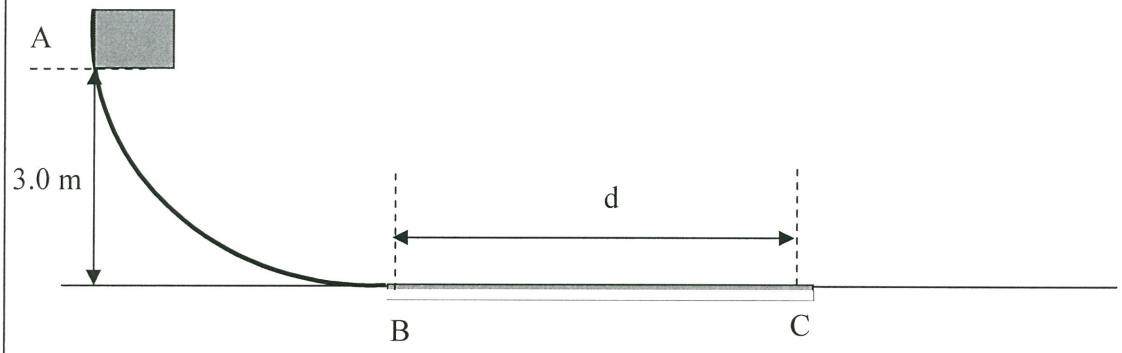

FIGURE Q3(b)

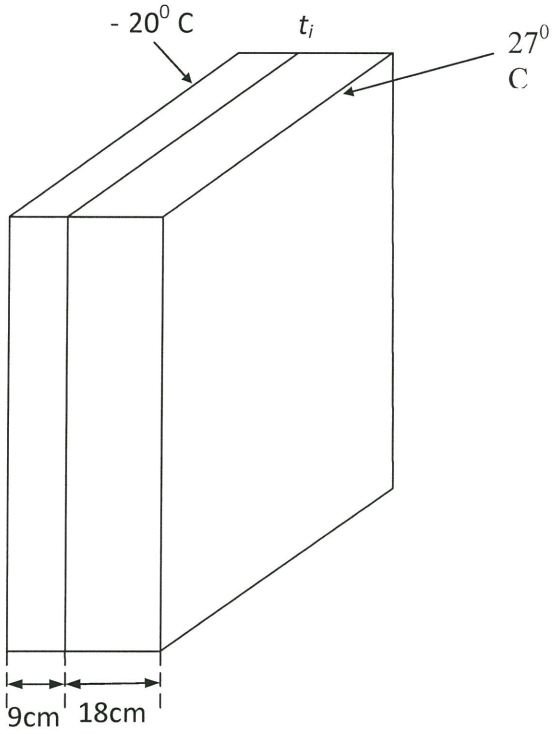

FIGURE Q4(a)

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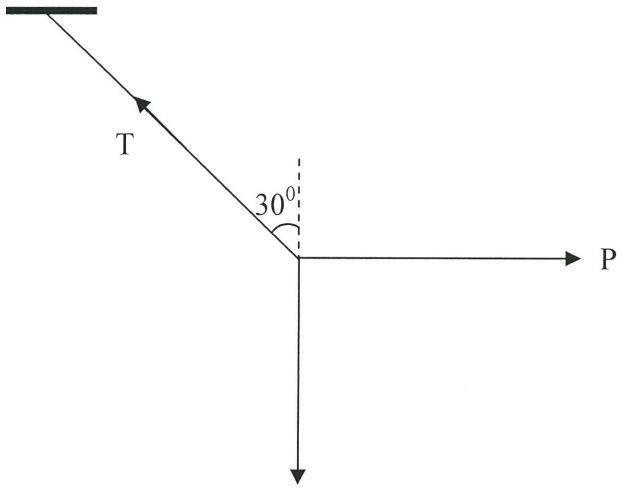

FIGURE Q5(c)

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LIST OF FORMULA

Gravity acceleration, $g = 9.81\ m/s^2$	1 feet = 12 in 1 feet = 30.48cm=0.3048 m 1 mi = 1.609 km	$P = m \cdot v$
$W = F \cdot s = Fs\cos\theta$	$E_u = \frac{1}{2}kx^2 = \frac{1}{2}m\omega^2 x^2$	$s = r\theta$
$K = \frac{1}{2}mv^2$	$E_J = E_k + E_u = \frac{1}{2}m\omega^2 A^2$	$v = r\omega$
$U = mgh$	$R = \sqrt{R_x^2 + R_y^2}$	$a = r\alpha$
$\Delta K = -\Delta U$	$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right)$	$\omega = \frac{d\theta}{dt}$
$W_n = \Delta K$	$v = u + at$	$\alpha = \frac{d\omega}{dt}$
$\frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = -(mgh_2 - mgh_1)$	$s = ut + \frac{1}{2}at^2$	$a_c = \frac{v^2}{r} = \omega^2 r$
$a = -\omega^2 \cdot x$	$v^2 = u^2 + 2as$	$a = r\sqrt{\omega^4 + \alpha^2}$
$f = \frac{1}{T} = \frac{\omega}{2\pi}$	$\sum F = ma$	$\omega = \omega_o + \alpha t$
$v = \omega\sqrt{A^2 - x^2}$	$W = mg$	$\theta = \omega_o t + \frac{1}{2}\alpha \cdot t^2$
$E_k = \frac{1}{2}mv^2 = \frac{1}{2}m\omega^2(A^2 - x^2)$	$f_k = \mu_k N$ $f_s = \mu_s N$	$\omega^2 = \omega_o^2 + 2\alpha \cdot \Delta\theta$