Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	PHYSICS FOR ENGINEERING TECHNOLOGY
COURSE CODE	:	BWM 12603
PROGRAMME	:	1 BNC, BNN
EXAMINATION DATE	:	DECEMBER 2014/ JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY.

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

Q1 (a) Picul is local old unit of weights. 1 picul = 1600 tahil, 1 tahil = 10.0 chees and 1 chee = 10.0 hoons. The weight of 1 hoon corresponds to a mass of 0.3779 g. A block of rubber weighs 39.8 piculs. How much mass of the rubber in kilograms. State the final answer with appropriate significant figures.

(6 marks)

(b) The outflow speed of a liquid from the bottom of the vessel is expressed as, $v = k\, p^x \rho^y$, where p is applied pressure on the surface of the liquid, ρ is the density of the liquid, k, x and y are constants without dimension. Determine x and y.

(7 marks)

(c) An airplane, which air speed is 680 km h^{-1}, is supposed to fly in a straight path 35.0^0 N of E, but a steady 12 km h^{-1} wind blowing from the North. What is the magnitude and direction of the resultant speed of the plane?

(7 marks)

Q2 (a) Three forces **F_1, F_2 and F_3** acts in the plane of a square lamina ABCD with side a meter, as shown in Figure **Q2(a)**. Calculate the resultant moment about an axis perpendicular to the lamina through A. State the sense in which it acts.

(8 marks)

(b) A block of mass $m_1 = 50$ g on a rough, inclined surface, is connected to a mass m_2 of 10 g by a lightweight cord over a light frictionless pulley, as shown in Figure **Q2(b)**. The inclined surface make an angle of 30^0 with horizontal. 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

(4 marks)

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

(4 marks)

(iii) Determine the tension of the cord.

(4 marks)

Q3 (a) (i) How high would water rise in the pipes of building if the water pressure gauge shows the pressure at the ground floor to be 270 kPa?

(3 marks)

(ii) At the height of 33,000 ft above sea level, atmospheric pressure is about 210 mm mercury. Assume the pressure inside the airplane is 760 mm mercury, what is the RESULTANT NORMAL FORCE on 600 cm^2 window of an airplane flying at this height?

(5 marks)

(b) The density of ice is 917 kg/m^3. What fraction of volume of the piece of ice will be above water when floating in fresh water? The density of fresh water is 1000 kg/m^3.

(5 marks)

(c) (i) Explain the meaning of tensile strength of copper is 4.0 $x10^8$ Pa.

(2 marks)

(ii) Copper has an elastic limit of 2.0 x 10^8 Pa and tensile strength of 4.0x 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 permanent deformation?

(5 marks)

Q4 (a) A crane lifts a 720-kg wreckage of a car 30 m vertically from a ravine by means of a cable without acceleration.

(i) How much work is done on the wreckage by the gravitational force?

(4 marks)

(ii) Just after the wreckage is placed on the ground, what is the change in gravitational potential energy of the wreckage?

(4 marks)

(b) A 1200-kg car moves from rest down a driveway that inclined 20° to the horizontal and is 15.0 m long. Determine the speed of the car at the end of the driveway if

(i) friction is negligible.

(6 marks)

(ii) a friction of 3000 N opposes the motion.

(6 marks)

Q5 (a) A steel wire of 2.0 mm^2 cross-section is held straight (but under no tension) by attaching it firmly to two points a distant 1.5 m apart at 38 ^oC. The linear expansion coefficient, α of steel is 1.1 x 10^{-5} $^oC^{-1}$ and its Young modulus of elasticity is $Y = 2.0 \times 10^{11}$ N m^{-2}. If the temperature decreases to 18 ^oC, what will be

(i) the change in length of the wire?

(3 marks)

(ii) the tension in the wire?

(4 marks)

(b) A 20 g of milk at 25 ^oC is added to a cup of 250 g of coffee at 90 ^oC. Assume water, coffee and milk all have the same value of specific heat capacity and no heat loss to the surrounding, what is the (equilibrium) temperature of the liquid?

(6 marks)

(c) A beverage cooler box is in the shape of cube, 42 cm on each inside edge. Its 3.0-cm thick wall are made of styrofoam with thermal conductivity of 0.03 Wm^{-1} K^{-1}. When the outside temperature is 30 ^oC, how much ice will melt inside the cooler each hour? Note that the cubical box has six sides and latent heat of fusion for ice is 3.34 x 10^5 J kg^{-1}.

(7 marks)

Q6 (a) The equation of transverse wave traveling along a string is

$$y = 0.15 \sin (0.79 x - 13t),$$

in which x and y are in meters and t in seconds. Find the

(i) amplitude of the wave.

(2 marks)

(ii) frequency of the wave.

(2 marks)

(iii) velocity and the direction of the propagation of the corresponding wave.

(3 marks)

(iv) wavelength of the wave.

(3 marks)

(b) A wire of mass 8.70 g is stretched so that it ends are tied down at points 150 cm a part and is under tension of 120 N. The wire then is allowed to vibrate in its fundamental mode.
Determine

(i) the speed of propagation of the wave through the wire.

(5 marks)

(ii) the frequency of the fundamental mode of the wave.

(5 marks)

-END OF QUESTION-

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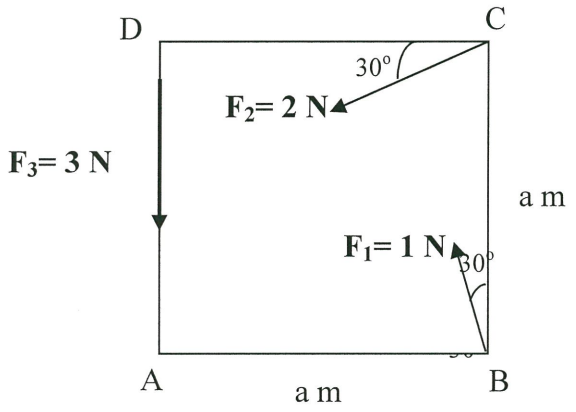

FIGURE Q2(a)

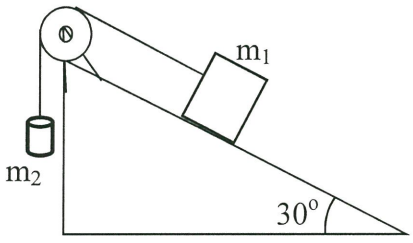

FIGURE Q2(b)

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LIST OF CONSTANTS & FORMULA

Acceleration due gravity,g = 9.81 m/s^2 1atm = 101.3 kPa	1 feet = 12 in 1 feet = 30.48cm=0.3048 m 1 mi = 1.609 km	For Water: ρ = 1000 kg m-3 c = 4.2 kJ kg-^{1}K^{-1} L_f = 334 kJ kg^{-1} L_v =2256 kJ kg^{-1}
$\sum F = ma$; $\tau = F d_\perp$	$P = Fv$	$\alpha = \frac{\Delta l}{l_o \Delta\theta}$
$R = \sqrt{R_x^2 + R_y^2}$; $\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right)$	$p_{abs} = p_{atm} + \rho gh$	$\beta = \frac{\Delta A}{A\Delta\theta} = 2\alpha$
$f_k = \mu_k N$ $f_s = \mu_s N$	$F_b = \rho g V$	$\gamma = \frac{\Delta V}{V\Delta\theta} = 3\alpha$
W = Fs cosθ	Y= $\frac{F/A}{\Delta l/l}$	$Q = mc\Delta\theta$
$K = \frac{1}{2}mv^2$	$S = \frac{F/A}{\Delta x/L}$	$Q = mL_f$ $Q = mL_v$
$U = mgh$	$B = -\frac{\Delta p}{\Delta V/V}$	$\frac{\Delta Q}{\Delta t} = -kA\frac{\Delta T}{\Delta x}$
$W_n = -\Delta U$; $W_n = \Delta K$	$v = \frac{\omega}{k} = \lambda f$	$v = \sqrt{B/\rho}$
$E_f - E_i = W_{nc}$	$f = \frac{1}{T} = \frac{\omega}{2\pi}$	$v = \sqrt{Y/\mu}$
$\frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = -(mgh_2 - mgh_1)$	$\lambda_n = \frac{2L}{n}$;	$\lambda_n = \frac{4L}{n}$