INTI International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	**April 2017**
Programme	:	Diploma In Electrical & Electronic Engineering (DEEI)
Course	:	**PHY1131: PHYSICS**
Date of Examination	:	2 August 2017 (Wednesday)
Time	:	8:00am – 10:00am Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Physics Formula Booklet

Examiner(s) : **Chong Mee Teng**

Moderator : Dr. Khoo Bee Ee

*This paper consists of **6** printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME
PHY 1131: PHYSICS
FINAL EXAMINATION: APRIL 2017 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) State the number of significant digits in the following measurements. (3 marks)

(i) 80320 m

(ii) 5.01×10^3 m

(iii) 0.00720 m

(b) A certain car has a fuel efficiency of 25.0 miles per gallon (mi/gal). Express this efficiency in kilometers per liter (km/L). Given 1 gallon = 3.786 liter and 1 mile = 1609 m. (3 marks)

(c) A body falls freely from rest. Find:

(i) the displacement after 3.0 s, (2 marks)

(ii) its velocity after falling 70 m, (2 marks)

(iii) the time required to reach a speed of 25 ms^{-1}. (2 marks)

(d) A field mouse trying to escape a hawk runs east for 5.0 m, darts Southeast for 3.0 m, then it drops south for 1.0 m down a hole into its burrow.

(i) By using graphical method, show these displacements and the resultant displacement. (2 marks)

(ii) Find the resultant displacement of the mouse from the starting point? (7 marks)

(e) The force, F on a sphere of radius, R moving with a velocity, v is given by $F = ARv^2$. What is the dimension of A in the equation? (4 marks)

Question 2

(a) A bomber is flying horizontally at a speed of 245 ms^{-1} and an altitude of 305 m when it drops a bomb.

(i) How far will the bomb move horizontally before it hits the ground? (4 marks)

(ii) What will be its velocity just before it hits the ground? (4 marks)

(b) What is the minimum coefficient of static friction, μ_s between table and block for which the blocks in **Figure (1)** will remain in equilibrium? What is the tension, T? (8 marks)

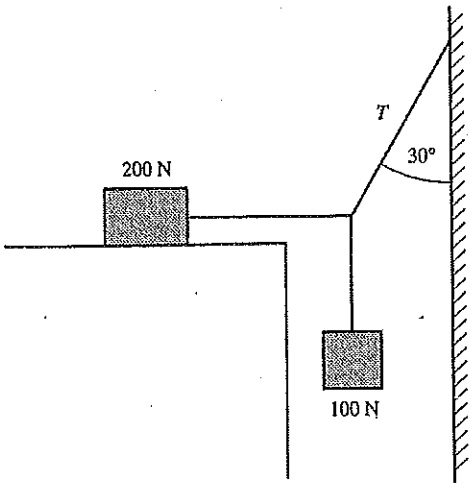

Figure (1)

(c) Explain briefly why a body moving with constant speed, v in a circular path of radius, r experiences an acceleration, a. (3 marks)

(d) A block of mass, m = 6.5 kg is released from rest at the top of a frictionless incline of height 3.0 m, as shown in **Figure (2)**. Upon reaching the bottom, the block slides a distance, L = 12.0 m along a horizontal surface that has friction, until coming to rest.

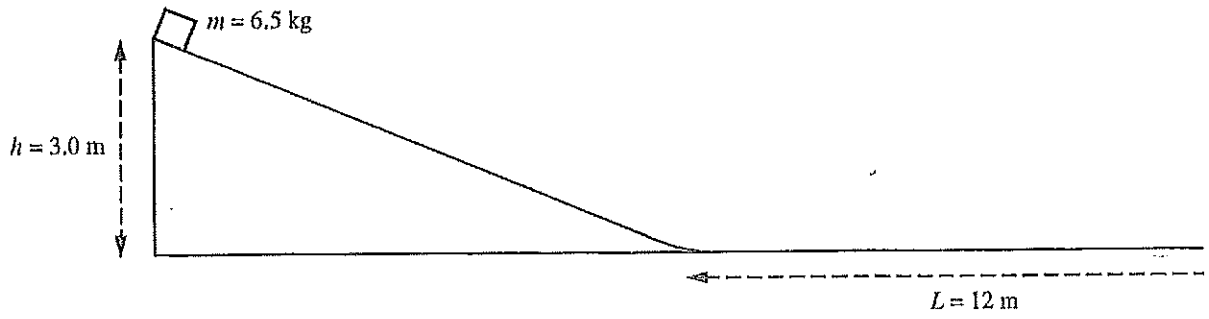

Figure (2)

(i) Using energy considerations, find the thermal energy gained by the system.(3 marks)

(ii) Find the coefficient of friction, μ_k between the block and the horizontal surface. (3 marks)

Question 3

(a) **Figure (3)** shows a sphere of mass 0.40 kg moving with a horizontal velocity of 18 ms^{-1} hits a vertical wall. After 0.02 s, the sphere rebounded backward with its initial velocity. Find:

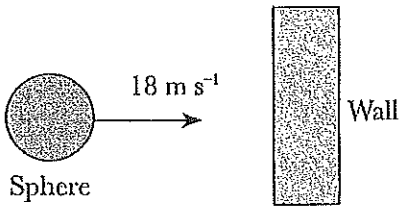

Figure (3)

(i) the impulse of the sphere, (3 marks)

(ii) the average force exerted by the sphere on the wall. (2 marks)

(iii) Is the collision elastic or inelastic? Justify your answer. (3 marks)

(b) In **Figure (4)**, two concrete spans of a 250 m long bridge are placed end to end so that no room is allowed for expansion. If the temperature increases by 20.0 ^{0}C, what is the height, y to which the spans rise when they buckle? Given the coefficient of linear expansion of concrete spans, $\alpha = 12 \times 10^{-6}$ ^{o}C^{-1}. (6 marks)

Figure (4)

(c) A 100 g cube of ice at 0 °C is dropped into 1.0 kg of water that was originally at 80 °C. What is the final temperature of the water after the ice has melted? Given the heat of fusion of water, $L_F = 3.33 \times 10^5$ Jkg^{-1} and the specific heat capacity of water, $c_w = 4186$ Jkg^{-1}^{o}C^{-1}. (6 marks)

(d) **Figure (5)** shows three point charges: Q_1, Q_2 and Q_3 lying on a straight line where $Q_1 = -30$ μC and $Q_3 = -70$ μC. If the net force acting on Q_2 is zero, find the value of distance, y. (5 marks)

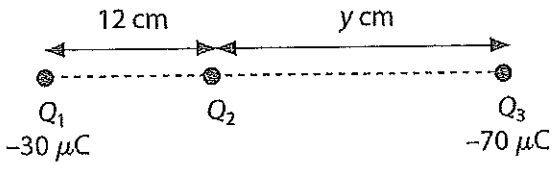

Figure (5)

Question 4

(a) A 20.0 L tank of carbon dioxide gas, CO_2 is at a pressure of 9.50×10^5 Pa and temperature of 19.0 °C. Given the molecular mass of $CO_2 = 44.0$ gmol^{-1} and $1L = 1 \times 10^{-3}$ m^3.

(i) Calculate the number of moles of gas in the tank. (3 marks)

(ii) Obtain the number of grams of carbon dioxide in the tank. (2 marks)

(iii) A fire breaks out, raising the ambient temperature by 224.0 K while 82.0 g of gas leak out of the tank. Calculate the new temperature and the number of moles of gas remaining in the tank. (3 marks)

(iv) Calculate the final pressure in the tank as a result of the fire and leakage. (2 marks)

(b) A square coil of sides 15 cm carrying a current of 2.0 A is placed in a uniform magnetic field of flux density 0.55 T as shown in the **Figure (6)**.

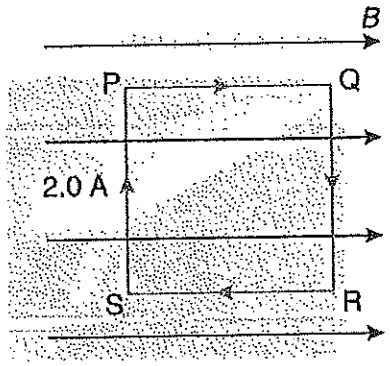

Figure (6)

(i) Mark with arrows the direction of the magnetic force, if any, on each side of the square. (2 marks)

(ii) Calculate the magnitude of the force on the side PS. (2 marks)

(iii) Explain why the resultant force of the wire frame is zero. (2 marks)

(iv) Describe what happens to the coil. (2 marks)

(c) Calculate the nature, position and magnification of the image of an object placed 14.0 cm in front of a converging lens of focal length 6.0 cm. (7 marks)

Question 5

(a) Two lightbulbs are each connected to a voltage of 120 V. One has a power of 25 W, the other 100 W. Which lightbulb has the higher resistance? Which lightbulb carries more current? (4 marks)

(b) A potential difference of 9.0 V is causing electrons to flow through a steel wire so that 1.0 x 10^{20} electrons pass a point in the wire in 60 s. Calculate:

(i) the charge which passes the point in 60 s, (2 marks)

(ii) the electric current in the wire, (2 marks)

(iii) the resistance of the wire. (2 marks)

(c) For a system of capacitors shown in **Figure (7)**, find:

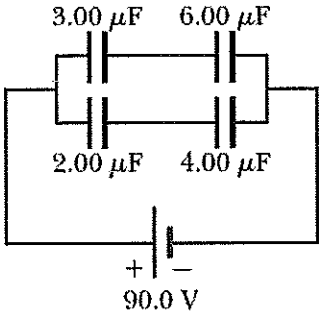

Figure (7)

(i) the equivalent capacitance of the system, (4 marks)

(ii) the charge on each capacitor, (3 marks)

(iii) the potential difference across each capacitor. (2 marks)

(d) The light beam shown in **Figure (8)** makes an angle of 20.0 ^{0}C with the normal line *NN'* in the linseed oil. Determine the angle θ and θ'. Given that the refractive index for linseed oil, n_{oil} = 1.480, refractive index for water, n_{water} = 1.333 and refractive index for air, n_{air} = 1.000. (6 marks)

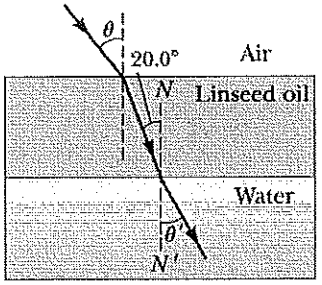

Figure (8)

—THE END—