INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	**January 2016**
Programme	:	Diploma in Electrical and Electronic Engineering (DEEI)
Course	:	**PHY 1121: Physics**
Date of Examination	:	17 March 2016 (Thursday)
Time	:	8.00am – 10.00am
Duration	:	2 Hours Reading Time : Nil
Special Instructions	:	

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

IMPORTANT NOTE : **THIS PAPER SHOULD NOT BE TAKEN OUT OF THE EXAMINATION HALL**

Materials Permitted :
Non-Programmable Calculator

Materials Provided :
Physics Formula Booklet

Examiner(s) : **Ms. 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 AND ELECTRONIC ENGINEERING PROGRAMME
PHY 1121: PHYSICS
FINAL EXAMINATION: JANUARY 2016 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) Given that 1 inch = 2.54 cm; 12 points = 1 pica and 6 picas = 1 inch. Spacing in a book was generally done in units of points and picas. If a figure was misplaced in the page proofs by 0.80 cm, what was the misplacement in points and picas? (6 marks)

(b) A car is stopped at a traffic light. It then travels along a straight road so that its distance from the light is given by $x = bt^2 + ct^3$, where b = 1.40 ms^{-2} and c = 0.150 ms^{-3}. Calculate:

(i) the average velocity of the car for the time interval $t = 0$ to $t = 10.0$ s, (3 marks)

(ii) the instantaneous acceleration of the car at $t = 5.0$ s. (4 marks)

(c) A person is going for a walk follows the path shown in **Figure (1)**. Determine the person's resultant displacement (magnitude and direction) from the starting point. (8 marks)

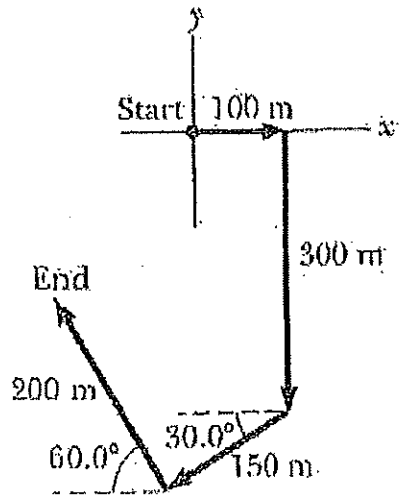

Figure (1)

(d) An object moves with constant speed v in a circle of radius r. The magnitude a of its acceleration is claimed to be given by $a = 2v^2/r$. Is this equation dimensionally consistent? (4 marks)

Question 2

(a) A child throws a ball with an initial speed of 8.00 ms^{-1} at an angle of 40.0° above the horizontal. The ball leaves her hand 1.00 m above the ground and experience negligible air resistance.

(i) How long is the ball in flight before it hits the ground? (3 marks)

(ii) How far from where the child is standing does the ball hit the ground? (2 marks)

(iii) What is the ball's velocity just before it hits the ground? (4 marks)

(b) **Figure (2)** shows a small block of mass 100 g is pressed against a wall by a force, F inclined at 64° to the wall. The coefficient of kinetic friction, μ_k between the block and the wall is 0.56.

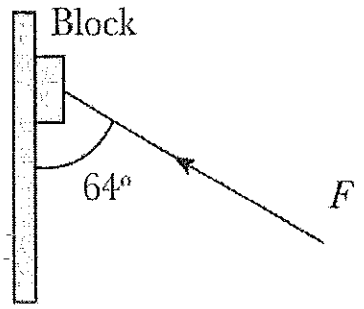

Figure (2)

(i) Draw a free body diagram to show all the forces acting on the block. (2 marks)

(ii) Find the force, F which just prevents the block from sliding down. (4 marks)

(iii) If the force, F is increased but acted at the same angle, what will happen to the block? Give reasons to support your answer. (3 marks)

(c) Ball **A** of mass 800 g moving at 5 ms^{-1} collides with another ball **B** of mass 500 g moving at 6 ms^{-1} in the opposite direction. After collision, ball **A** bounces backward with velocity 0.2 ms^{-1}.

(i) State the principle of conservation of momentum. (2 marks)

(ii) Find the velocity of ball **B** after the collision. (2 marks)

(iii) Show with calculation that the collision inelastic. (3 marks)

Question 3

(a) A block of mass 3 kg starts from rest and slides down a surface which corresponds to a quarter circle of 1.6 m radius, refer to **Figure (3)**.

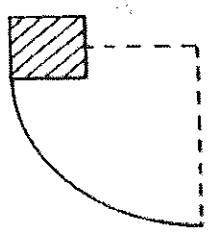

Figure (3)

(i) If the curved surface is smooth, what is the speed at the bottom? (2 marks)

(ii) If the speed at the bottom is 4 ms^{-1}, what is the energy dissipated by friction in the descent? (3 marks)

(iii) After the block reaches the level region at 4 ms^{-1}, it slides to a stop in 3m, find the frictional force. (3 marks)

(b) When a 290.0 g piece of iron at 180.0 °C is placed in a 95.0 g aluminum calorimeter cup containing 250.0 g of glycerin at 10.0 °C, the final temperature is observed to be 38.0 °C. Find the specific heat of glycerin. (Given the specific heat of iron, c_{iron} = 450.0 $Jkg^{-1}°C^{-1}$, the specific heat of aluminium, c_{al} = 900.0 $Jkg^{-1}.°C^{-1}$) (5 marks)

(c) A nickel-steel rod at 21°C is 0.62406 m in length. Raising the temperature to 31°C produces an elongation of 121.6 μm. Find the length at 0°C and the coefficient of linear expansion. (5 marks)

(d) In **Figure (4)**, three point charges, Q_1 = +35 μC, Q_2 = +47 μC and Q_3 = -53 μC, lie on a straight line in vacuum.

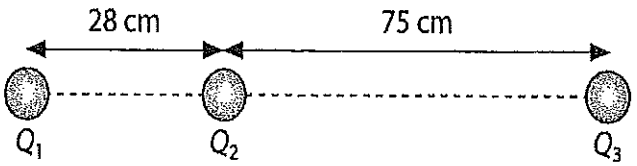

Figure (4)

(i) Calculate the resultant force acting on Q_1. (4 marks)

(ii) Where could a forth charge, Q_4 = -25 μC be located such that the net electrostatic force on Q_1 is zero? (3 marks)

Question 4

(a) A 0.025 m^3 tank contains 0.084 kg of nitrogen gas, N_2 at a gauge pressure of 3.17 atm. Find the temperature of the gas in degrees Celsius. (Given the universal gas constant, R = 8.31 $Jmol^{-1}K^{-1}$, atmospheric pressure, P_{atm} = 1.013 x 10^5 Pa & 1 kmol of N_2 is 28 kg) (4 marks)

(b) A filament bulb **A** is rated 240 V, 100 W and another bulb **B** is rated 240 V, 60 W.

(i) Find the ratio of the resistances of the filaments at their normal working temperature. (3 marks)

(ii) If each of the bulbs are connected in turns to a 120 V supply, what is the power dissipated from each bulb? (2 marks)

(c) **Figure (5)** shows a section of a deflection system of a cathode ray oscilloscope. An electron travelling at a speed of 1.5 x 10^7 ms^{-1} enters the space between two parallel metal plates which are 60 mm long. The electric field between the plates is 4.0 x 10^3 Vm^{-1}.

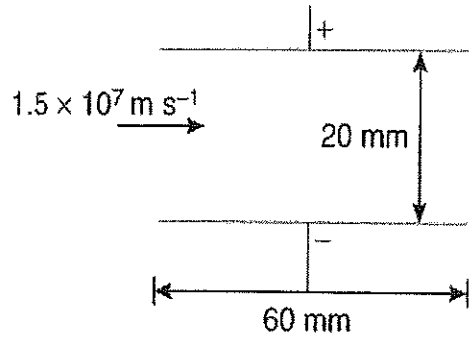

Figure (5)

(i) Copy the figure, and sketch the path of the electron in between the plates, and after emerging from the space between the plates. (2 marks)

(ii) Find the acceleration (magnitude and direction) of the electron in between the plates. (3 marks)

(iii) Hence calculate the vertical and horizontal components of the electron velocity when it emerges from the space between the plates. (4 marks)

(iv) From part (iii), find the angle of deflection of the electron beam. (2 marks)

(d) A concave lense with a radius of curvature of 40 cm forms an image of a real object which has been placed 25 cm from the lense.

(i) Calculate the distance of the image from the lense. (3 marks)

(ii) Define the magnification factor for this lense. (2 marks)

Question 5

(a) In **Figure (6)**, two vertical long parallel wires P and Q are separated by a distance of 5.0 cm along the east-west direction. The current in the east wire P is 5 A upwards and the current in the west wire Q is 10 A in the opposite direction. If the horizontal component of the Earth's magnetic field is 2.0 x 10^{-5} T, calculate the resultant force per unit length on the wires. (8 marks)

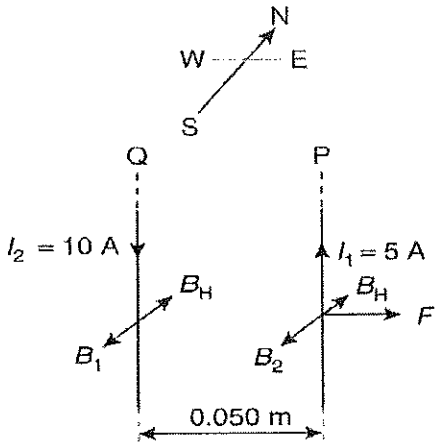

Figure (6)

(b) **Figure (7)** shows $C_1 = C_3 = 8.0$ μF, $C_2 = C_4 = 16$ μF, and $Q_3 = 23$ μC. Determine:

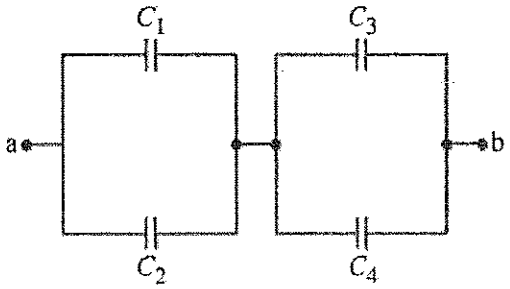

Figure (7)

(i) The charge on each capacitors, (7 marks)

(ii) The voltage across each capacitor, (4 marks)

(iii) The voltage V_{ba} across the combination. (2 marks)

(c) A light beam is incident at 40° relative to the normal on an air-glass interface. The index of refraction of the glass is 1.50. Calculate:

(i) angle of refraction inside the glass, (2 marks)

(ii) critical angle for total internal reflection of the glass. (2 marks)

--THE END--

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