



INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session : August 2019

Programme : Diploma in Electrical & Electronic Engineering (DEEI)

Course : PHY1131: Physics

Date of Examination : 14 December 2019 (Saturday)

Time : 5:00pm – 7:00pm 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 : Assoc. Prof. 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 (DEEI)

PHY 1131: PHYSICS

FINAL EXAMINATION: AUGUST 2019 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.
- (i) 3.40×10^3 s (1 mark)
 - (ii) 4.280 s (1 mark)
 - (iii) 0.0060 s (1 mark)
- (b) A rectangular building lot has a width of 75.0 ft and a length of 125 ft. Determine the area of this lot in square meters. Given that 1 m = 3.281 ft. (4 marks)
- (c) A person walks 53.1° north of east for 2.50 km, then due east for 2.00 km and finally 5.20 km at 30.0° south of west.
- (i) Show these displacements and the resultant by graphical method. (3 marks)
 - (ii) Find the resultant displacement of the person by component method. (6 marks)
- (d) A baseball is hit so that it travels straight upward after being struck by the bat. A fan observes that it takes 3.00 s for the ball to reach its maximum height. Calculate:
- (i) The ball's initial velocity. (4 marks)
 - (ii) The height it reaches. (3 marks)
- (e) Define the term "Instantaneous velocity". (2 marks)

Question 2

- (a) 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? Assume there is no heat exchange with the surroundings. For water, the specific heat is $4186 \text{ J/kg} \cdot \text{C}^\circ$ and the heat of fusion is $3.33 \times 10^5 \text{ J/kg}$. (5 marks)
- (b) A stone is thrown horizontally outward with an initial velocity, $v_0 = 4.96 \text{ m/s}$ from the top of a bridge. If the bridge is 19.6 m above the ground, determine the magnitude and direction of the velocity of a stone just before it strikes the ground. (7 marks)

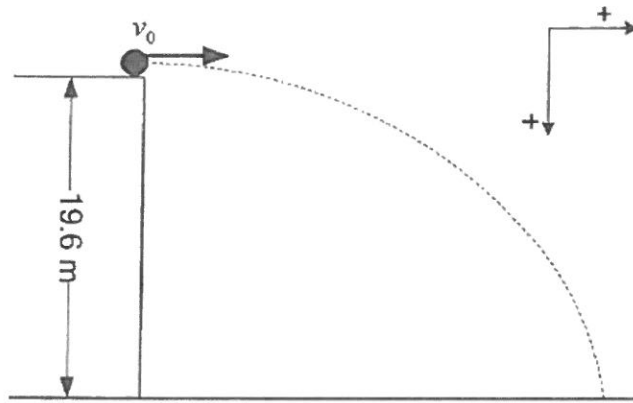


Figure (Q2b)

- (c) A block of mass, m at rest on a frictionless surface is acted on by forces, $F_1 = 10 \text{ N}$ and F_2 of unknown magnitude, as illustrated in the **Figure (Q2c)**.

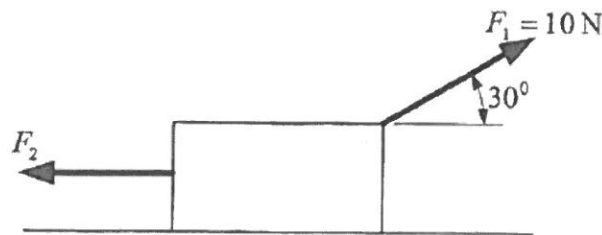


Figure (Q2c)

- (i) Determine the magnitude of force F_2 . (3 marks)
- (ii) If the normal force acting on the block is 4.8 N, calculate the mass, m of the block. (5 marks)
- (d) The acceleration due to gravity at the surface of a planet of mass, M and radius, R is given by the expression: $g = \frac{GM}{R^2}$. On Earth, this value is $g = 9.8 \text{ m/s}^2$. Suppose that a planet is discovered that has a mass 12 times that of Earth, and a radius 2.0 times that of Earth. What is the value of g on this planet? (5 marks)

Question 3

- (a) A 64.0 kg mass, M initially at rest breaks into pieces of $m_1 = 16.0$ kg and $m_2 = 48.0$ kg, due to an explosion that produces 2.4×10^3 J of total kinetic energy in the pieces. Calculate the velocity of mass m_1 and m_2 after the explosion. (10 marks)
- (b) A spring exerts a force of 88 N when compressed 0.16 m.
- (i) How much potential energy is stored in the spring, when compressed 0.16 m? (4 marks)
- (ii) The spring, compressed 0.16 m is used to launch a 0.055 kg ball horizontally. What is the maximum speed with which the ball can be launched? (4 marks)
- (c) The coefficient of thermal expansion for aluminium is $25 \times 10^{-6} / \text{C}^\circ$. What temperature change, ΔT is required to cause a 4.00 m long aluminium rod to expand by 0.01 m? (2 marks)
- (d) A certain mass of hydrogen gas occupies 370 mL at 16 °C and 150 kPa. Calculate its volume at -21 °C and 420 kPa. (5 marks)

Question 4

- (a) Two charged objects have a repulsive force of 0.0980 N. If the distance between the two charges is doubled, calculate the new force acting on these objects. (3 marks)
- (b) A certain parallel-plate capacitor consists of two plates, each with area 0.02 m^2 , separated separated 4.0 mm by air gap. Given that the permittivity of free space, $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$ and dielectric constant of air is 1.0.
- (i) Compute its capacitance. (3 marks)
- (ii) If the capacitor connected across a 500 V source, calculate the maximum charge and the maximum energy stored. (5 marks)
- (c) Mary has RM 1.05 credit on her pre-paid electricity meter. Electricity cost 50 sen per unit of kilowatt-hour. She gets home, cooks supper before dark using 2000 W stove for 50 minutes, then studies, using the 100 W bulb. How long will she be able to study with the supply of electricity? Show calculations to support your answer. (7 marks)

- (d) In the Bohr model of hydrogen atom, an electron ($q = -e$) circles a proton ($q' = +e$) in an orbit radius 5.3×10^{-11} m. The attraction of the proton for the electron furnishes the centripetal force needed to hold the electron in orbit. Given the Coulomb constant, $k = 9.0 \times 10^9 \text{ Nm}^2/\text{C}^2$ and the electron mass = 9.1×10^{-31} kg. Calculate:
- (i) The force of electrical attraction between the particles. (3 marks)
 - (ii) The electron's speed. (4 marks)

Question 5

- (a) Determine the current I through the battery for **Figure (Q5a)**. (7 marks)

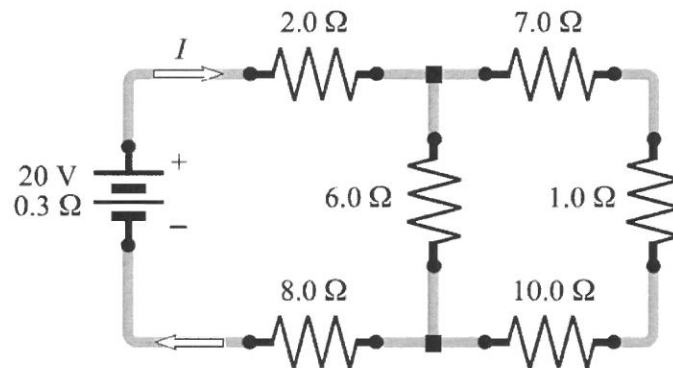


Figure (Q5a)

- (b) A proton travels with a speed of 3.0×10^6 m/s at an angle of 37° with the direction of a magnetic field of 0.30 T in the $+y$ direction. Calculate:
- (i) The magnitude of the magnetic force on the proton. (3 marks)
 - (ii) The proton's acceleration. (3 marks)
- (c) Find the direction of the force on a proton moving through the magnetic fields as shown in **Figure (Q5c(i))** and **Figure (Q5c(ii))**. (4 marks)

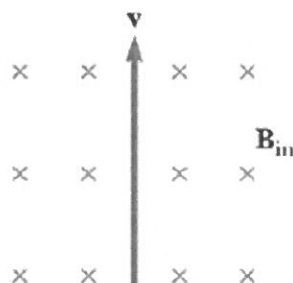


Figure (Q5c(i))

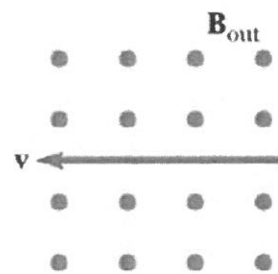


Figure (Q5c(ii))

- (d) An object is placed 5.8 cm to the left of a converging lens. It forms a sharp image on the screen at 9.00 cm to the right of the lens.
- (i). Find the focal length of the lens. (3 marks)
 - (ii) Define the magnification factor of the lens (2 marks)
 - (iii) Define the characteristic of the image formed. (3 marks)

--THE END--
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