FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**August 2021**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI) Diploma in Mechanical Engineering (DMEN)
Course	:	**PHY1121/PHY1131: Physics**
Date of Examination	:	6 December 2021 (Monday)
Time	:	4.00pm – 6.30pm Reading Time : Nil
Duration	:	2 Hours 30 Minutes

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Physics Formulae Booklet

Examiner(s)	:	**Chong Mee Teng**
Chief Moderator	:	Teow Hsien Loong

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

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME (DEEI)
DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
PHY1131 / PHY1121: PHYSICS
FINAL ALTERNAT IVE ASSESSMENT: AUGUST 2021 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Question 1

(a) Two parallel plates are set a distance of 12 mm apart in a vacuum as in **Figure Q1(a)**. The top plate is at potential of +300 V and the bottom plate is at a potential of –300 V. (Given magnitude charge of electron, e = 1.602 x 10^{-19} C)

(i) Show the electric field between the plates. (2 marks)

(ii) The field is uniform at the point mid-way between the plates. Compute the magnitudes of the electric field strength and the force on an electron at this point. (3 marks)

(iii) A high speed electron from an electron gun is projected towards the pair of plates as shown. Show a possible path of the electron as it passes between the plates. (2 marks)

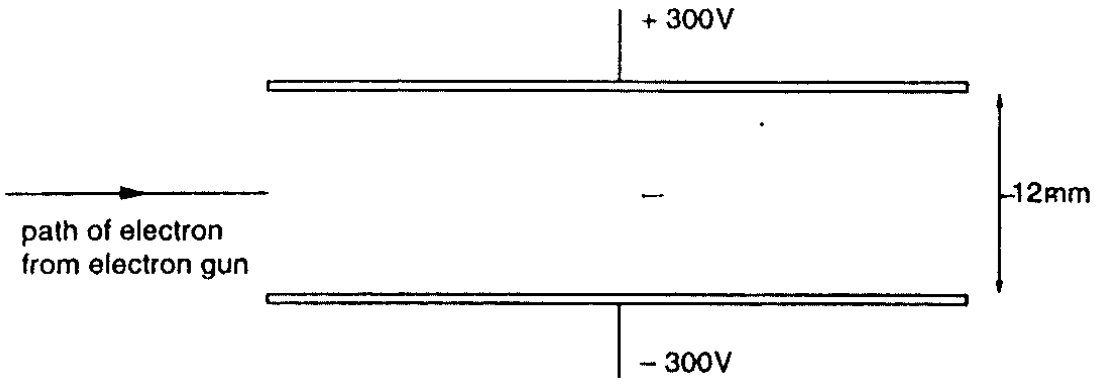

Figure Q1(a)

(b) **Figure Q1(b)** shows two positive charges placed at distance of 30.0 cm. Compute the electric field at the center point ***C***.

(8 marks)

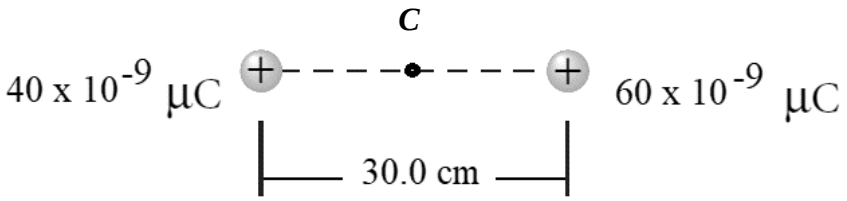

Figure Q1(b)

(c) In **Figure Q1(c),** an electron is initially moving to the right when it enters a uniform electric field directed upwards. Predict with explanation which trajectory the electron will follow.

(4 marks)

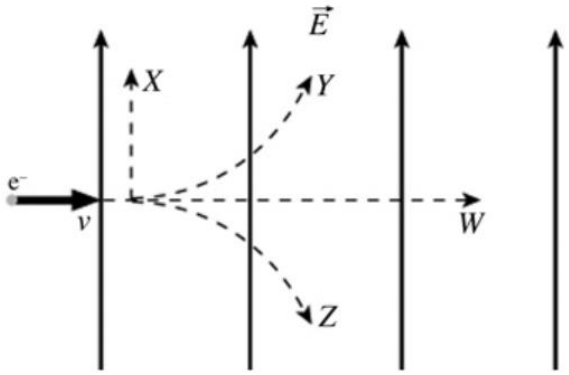

Figure Q1(c)

(d) Batteries are rated in terms of Ampere-hours (A•h). For example, a battery that can deliver a current of 3.0 A for 5.0 h is rated at 15 A•h.

(i) Compute the total energy, in kilowatt-hours, stored in a 12 V battery rated at 55 A•h.

(4 marks)

(ii) At RM 0.12 per kilowatt-hour, compute the value of the electricity that produced by this battery.

(2 marks)

Question 2

(a) **Figure Q2(a)** shows a group of three charges and a point ***M*** arranged in a form of rectangle. Compute the electric potential at point ***M*** due to other charges.

(8 marks)

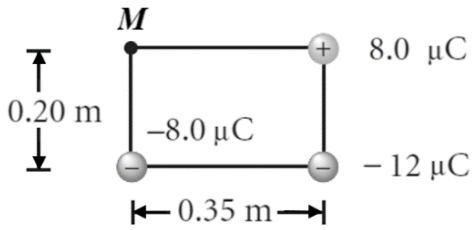

Figure Q2(a)

(b) An air-filled parallel capacitor with each plate having an area of 40 cm^2 and the separation of the two plates is 3.0 mm. The capacitor is connected to a 15 V battery. Given the permittivity of free space, ε_o = 8.85 x 10^{-12} Fm^{-1}, compute:

(i) the capacitance of the capacitor,

(2 marks)

(ii) the charge stored in the capacitor,

(2 marks)

(iii) the electric field between the plates.

(2 marks)

(c) A proton moves in a straight line from point ***a*** to point ***b*** beside a linear accelerator, a total distance, d = 0.50 m. The electric field is uniform along this line, with magnitude E = 1.5 ×10^7 V/m in the direction from ***a*** to ***b***. Compute:

(i) the magnitude of force on the proton,

(2 marks)

(ii) the work done on the by the field,

(2 marks)

(iii) the potential difference, $V_a - V_b$.

(2 marks)

(d) Two lightbulbs are each connected to a voltage of 120 V. One has a power of 25 W, the other 100 W.

(i) Predict with explanation which lightbulb has the higher resistance.

(3 marks)

(ii) Predict with explanation which lightbulb carries more current.

(2 marks)

Question 3

(a) A 6.0 μF capacitor and a 12 μF capacitor, each initially uncharged, are connected in series across a 12 V battery. Compute:

(i) the charge on each capacitor, and

(4 marks)

(ii) the potential difference across 6.0 μF capacitor and 12 μF capacitor.

(3 marks)

(b) The power supplied to the circuit in **Figure Q3(b)** is 4.0 W. Use the information in the diagram to compute:

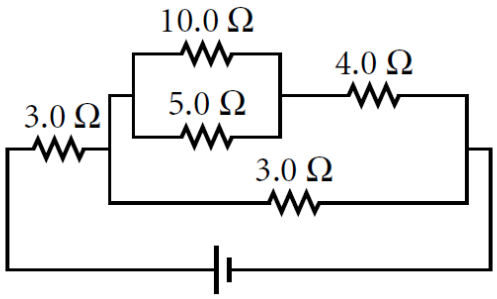

Figure Q3(b)

(i) the equivalent resistance of the circuit,

(6 marks)

(ii) the potential difference across the battery.

(2 marks)

(c) Interpret the followings terms:

(i) Semiconductor

(2 marks)

(ii) Diode

(2 marks)

(iii) Transistor

(2 marks)

(iv) Doping

(2 marks)

(v) Covalent bonds

(2 marks)

Question 4

(a) (i) Explain the difference between semiconductors, conductors and insulators on the basis of band gap.

(3 marks)

(ii) Explain the difference between intrinsic semiconductors and intrinsic semiconductors.

(2 marks)

(b) In **Figure Q4(b)**, a conductor, *PR* of length 1.0 m is suspended by two flexible wires and has a mass of 0.040 kg. It is connected to a cell and placed in a uniform magnetic field.

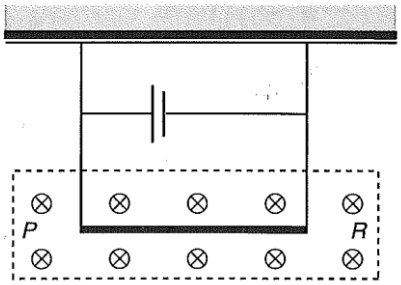

Figure Q4(b)

(i) Compute the current that must flow in the conductor so that the tension in the supporting wires is zero when the magnetic field is 1.2 T into the page.

(3 marks)

(ii) Predict the direction of the current?

(2 marks)

(iii) Compute the tension in each wire if the direction of the current is reversed?

(5 marks)

(c) **Figure Q4(c)** shows three long, straight wires. Compute the force experienced by a 25 cm length of wire C.

(10 marks)

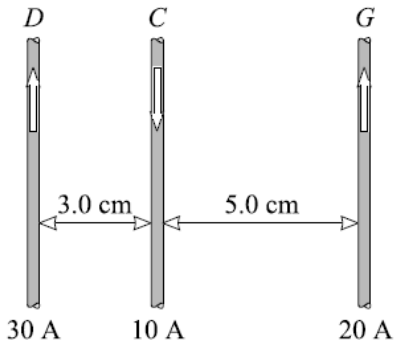

Figure Q4(c)

~THE END~