FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2022**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI) Diploma in Mechanical Engineering (DMEN)
Course	:	**PHY1121/PHY1131: Physics**
Date of Examination	:	August 2, 2022 (Tuesday)
Time	:	12.00pm – 2.30pm 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.

NOTE : 30 minutes is added into the duration of the examination to factor in any connectivity matters and for you to scan and upload your scripts.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Physics Formulae Booklet

Examiner(s)	:	**Mr Manickampraslad M Sambasivam** and Chong Mee Teng
Chief Moderator	:	Mr Mohamad Faiz Osrin

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

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME (DEEI)
DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
PHY1121 / PHY1131: PHYSICS
FINAL ALTERNATIVE ASSESSMENT: APRIL 2022 SESSION

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

Question 1

(a) Two flat parallel plates, each of length 12.0 cm, are separated by a distance of 1.5 cm, as shown in Figure Q1(a). The space between the plates is a vacuum. The potential difference between the plates is 210 V. The electric field may be assumed to be uniform in the region between the plates and zero outside this region. An electron initially travels parallel to the plates along a line mid-way between the plates. The speed of the electron is 5.0×10^7 m/s.

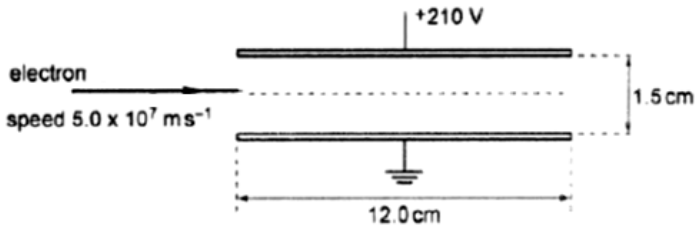

Figure Q1 (a)

(i) Compute the magnitude of the electric field strength between the plates.
(2 marks)

(ii) Compute the magnitude and direction acceleration of the electron between the plates.
(4 marks)

(iii) Compute the time for the electron to travel a horizontal distance equal to the length of the plates.
(2 marks)

(iv) Use your answer in part (iii), predict whether the electron will hit one of the plates or emerge from between the plates.
(3 marks)

(b) Three points charges are aligned along the x-axis as shown in Figure Q1 (b). Compute the electric field at the position $x = +2.0$ m, $y = 0$. Given the Coulomb constant, $k = 9.0 \times 10^9$ Nm^2/C^2.

(9 marks)

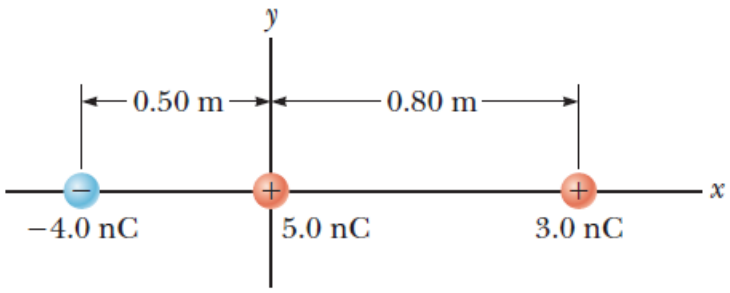

Figure Q1 (b)

Two wires A and B with circular cross sections are made of the same metal and have equal lengths, but the resistance of wire A is three times greater than that of wire B. Compute the ratio of the cross-sectional area of wire A to that of wire B.

(5 marks)

Question 2

(a) Figure Q2 (a) shows three positive point charges of 3.0 nC, 6.0 nC, and 2.0 nC, respectively, are arranged in a triangular pattern. Compute the magnitude and direction of the electric force on the 6.0 nC charge.

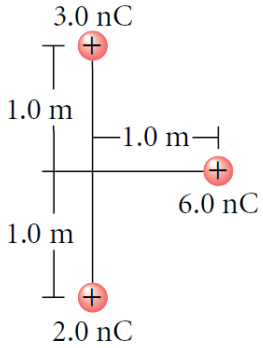

Figure Q2 (a)

(8 marks)

(b) A ceramic capacitor has an effective plate area of 4 cm^2 separated by 0.1 mm of ceramic of relative permittivity 100.

(i) Compute the capacitance in picofarads.

(4 marks)

(ii) If the capacitor in part (a) is given a charge of 1.2μC, compute the potential difference between the plates.

(4 marks)

(c) Compute the followings referring to Figure Q2 (c):

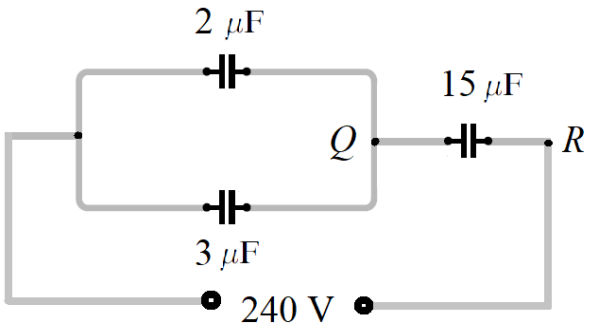

Figure Q2 (c)

(i) The equivalent capacitance of the circuit. (2 marks)

(ii) The voltage across *Q* and *R*. (4 marks)

(iii) The charge on each capacitor. (3 marks)

Question 3

(a) Compute the current *I* in the circuit shown in Figure Q3 (a**).** (8 marks)

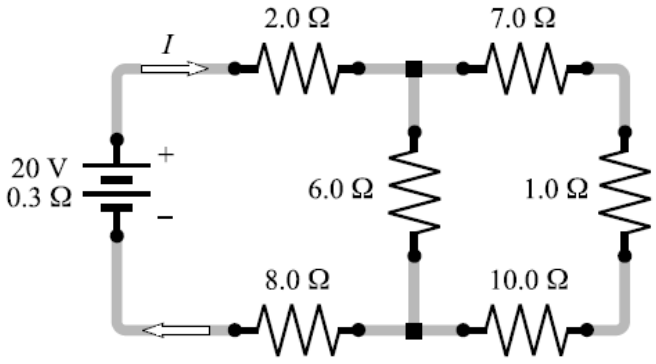

Figure Q3 (a)

(b) Two capacitors are connected to supply of 1000 V as shown in Figure Q3 (b). Compute:

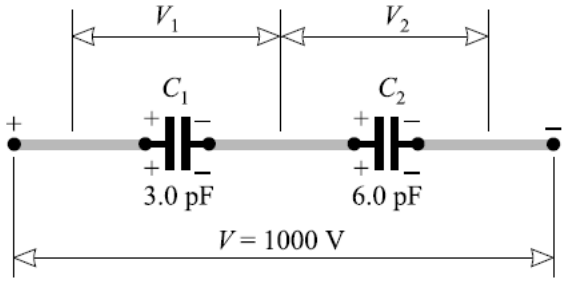

Figure Q3 (b)

(i) The equivalent capacitance.

(3 marks)

(ii) The magnitude of the charges on the capacitors.

(3 marks)

(iii) The potential differences V_1 and V_2.

(4 marks)

(iv) The energy stored in the capacitor C_1 and C_2.

(4 marks)

(c) Interpret the followings:

(i) Energy Gap

(2 marks)

(ii) Intrinsic and Extrinsic semiconductors.

(2 marks)

Question 4

(a) Interpret the followings:

(i) Define the electric current conduction in semiconductor.

(3 marks)

(ii) Define the two types of impurities added to the semiconductor.

(2 marks)

(b) Figure Q4 (b**)** shows an electric field formed between two metal plates separated by 2.0 cm and a magnetic field of 0.025 T perpendicular to it. A proton travelling with a velocity of 3.0 x 10^6 m/s enters the combined field perpendicularly and passes through un-deflected by the fields. Compute:

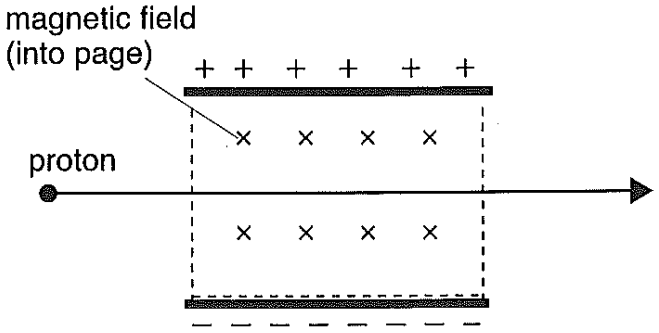

Figure Q4 (b)

(i) The electric field strength between the two metal plates.
(2 marks)

(ii) The voltage between the two plates.
(2 marks)

(iii) The acceleration of the particle when the electric field is switched off.
(3 marks)

(iv) The acceleration of the particle when the magnetic field is switched off.
(3 marks)

(c) A proton is fired into a magnetic field of strength, $B = 0.16$ T. The velocity of the proton is 8.0×10^6 m/s at right angles to the field. (Given mass of proton, $m_p = 1.673 \times 10^{-27}$ kg and charge of proton, $e = 1.6 \times 10^{-19}$ C)

(i) Compute the magnitude of the force on the proton.
(2 marks)

(ii) Compute the radius of the path followed by the proton.
(3 marks)

(iii) Sketch the path followed by the proton in the magnetic field by indicating the direction of the magnetic force on the proton in your diagram.
(2 marks)

(iv) Explain the reason the proton moves in a circular path.
(3 marks)

-THE END-