FINAL ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2021**
Programme	:	Diploma In Mechanical Engineering (DMEN) Diploma In Electrical And Electronic Engineering (DEEI)
Course	:	**PHY1121/PHY1131: Physics**
Date of Examination	:	July 30, 2021 (Friday)
Time	:	8.00am – 10.30am Reading Time : Nil
Duration	:	2 Hours : 30 Minutes

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.

Special Instructions :

Answer **ALL** the questions

Materials permitted :

Scientific Calculator

Materials provided :

Formula booklet

Examiner(s) : **Manickampraslad M Sambasivam** and Chong Mee Teng

Moderator : Mohd Hafiz

*This paper consists of **7** printed pages, including the cover page*

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)
PHY1121/PHY1131: PHYSICS
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

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

Question 1

(a) In the **Figure Q1 (a)**, two large flat parallel plates have a potential difference of 200V applied to them. The plates are 0.10 m apart. An alpha particle, initially adjacent to the positive plate, accelerates towards the negative plate. Given that the charge of alpha particle = 3.20×10^{-19} C and the mass of alpha particle = 6.644×10^{-27} kg. Compute:

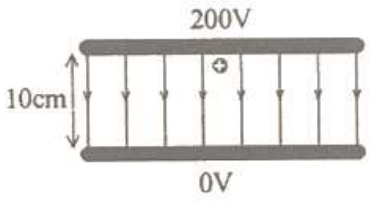

Figure Q1(a)

(i) the time the proton takes to move between the plates, and (7 marks)

(ii) the final velocity of the proton (just before it hits). (2 marks)

(b) In **Figure Q1 (b**), three point charges lie on the x axis; q_1 is at the origin, q_2 is at x = 2.0 m, and q_0 is at position x = 3.5 m. Compute the total electric force on q_0 due to q_1 and q_2 if q_1 = +25 nC, q_2 = -10 nC, and q_0 = +20 nC.

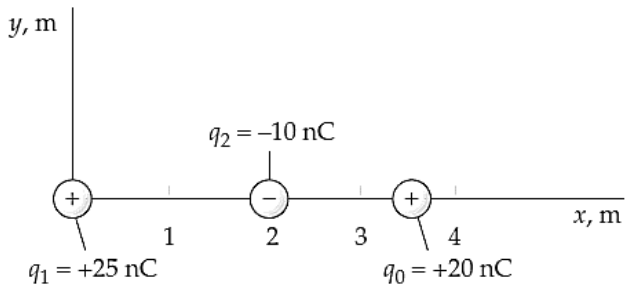

Figure Q1 (b)

(8 Marks)

(c) A digital clock has a resistance of 12 kΩ and is plugged into a 115 V supply. Compute the followings:

(i) The magnitude of current.

(3 marks)

(ii) The amount of power does it use.

(3 marks)

(iii) If the utility cost RM 0.12 per kWh, the cost to operate the clock for 30 days

(2 marks)

(Total: 25 marks)

Question 2

(a) A charge q_1 = 2.0 µC is located at the origin and a charge q_2 = -6.0 µC is located at (0, 3.00) m as shown in **Figure Q2 (a**).

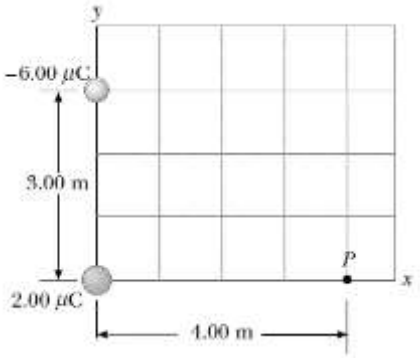

Figure Q2 (a)

(i) Compute the total electric potential due to these charges at the point ***P***, whose coordinates are (4.00, 0) m.

(3 marks)

(ii) Compute the change in potential energy of the system of two charges plus a charge q_3 = 3.00 µC as the latter charge moves from infinity to point ***P.***

(2 marks)

(b) A proton is released from rest in a uniform electric field that has a magnitude of 8.0 ×10^4 V/m as shown in **Figure Q2 (b)** below. The proton undergoes a displacement of 0.50 m in the direction of **E**.

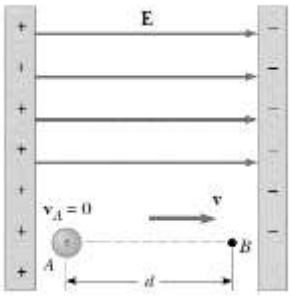

Figure Q2 (b)

(i) Compute the change in electric potential between points ***A*** and ***B.***

(2 marks)

(ii) Compute the change in potential energy of the proton-field system for this displacement.

(2 marks)

(iii) Compute the speed of the proton after completing the 0.50 m displacement in the electric field.

(2 marks)

(c) A current of 2.0 A flowing through a heater for an hour converts 1.7 MJ of electrical energy into heat energy. Compute:

(i) the potential difference across the heater, and

(3 marks)

(ii) the power rating of the heater.

(2 marks)

(d) Compute the followings for **Figure Q2 (d)**:

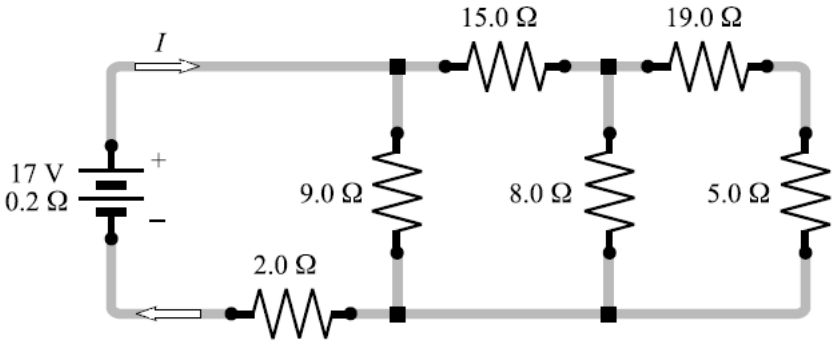

Figure Q2 (d)

(i) The total resistance of the circuit

(6 Marks)

(ii) The supply current *I*.

(3 Marks)

(Total: 25 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 the followings:

(i) The total charge of the capacitors.

(5 marks)

(ii) The potential difference across each capacitor.

(4 marks)

(b) For the circuit of **Figure Q3(b)**, compute:

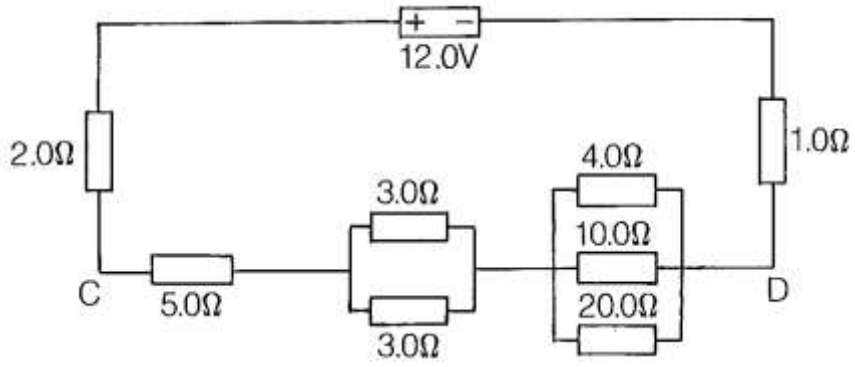

Figure Q3(b)

(i) the total resistance,

(6 marks)

(ii) the current flowing through the battery,

(2 marks)

(c) Interpret the followings:

(i) the semiconductors, conductors and insulators on the basic of band gap,

(3 marks)

(ii) the hole in a semiconductor and the hole current,

(3 marks)

(iii) the doping process.

(2 marks)

(Total: 25 marks)

Question 4

(a) (i) Illustrate how are a *p*-type and a *n*-type semiconductor formed.

(3 marks)

(ii) Illustrate the majority carrier in a *n*-type semiconductor and the process of its majority carriers produced.

(2 marks)

(b) Sketch the initial direction of the deflection of charged particles as they enter the magnetic fields as shown in **Figure Q4 (b)**.

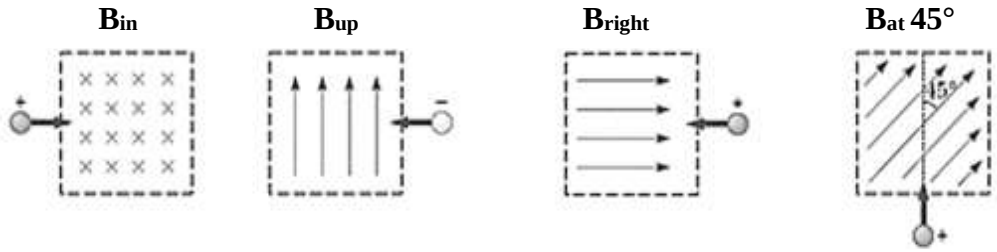

Figure Q4 (b)

(4 marks)

(c) A proton travels with a speed of 3.00×10^6 m/s at an angle of 37.0° with the direction of a magnetic field of 0.300 T in the *y* direction. Compute the followings:

(i) The magnitude of the magnetic force on the proton, and

(3 marks)

(ii) Its acceleration.

(3 marks)

(d) Electrons, in an electron microscope, are accelerated by a potential difference of 50,000 V.

(i) Compute the kinetic energy of the electrons as they leave the electron gun.

(2 marks)

(ii) Compute the speed of the electrons as they leave the electron gun.

(2 marks)

(iii) The electron now pass through a focusing magnetic field of strength, B = 2.0 T. They enter the field at right angles to it. Compute the magnitude of the force experienced by the electrons as they enter this field.

(2 marks)

(iv) The path of the electron in this magnetic field is depicted in the **Figure Q4 (d) (ii)** below. On this diagram, sketch a vector to show the path of the electrons as they leave the field.

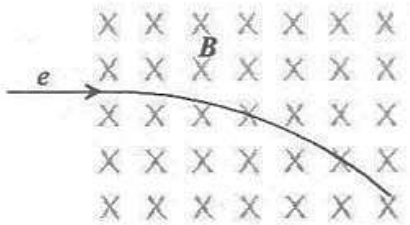

Figure Q4 (d) (ii)

(2 marks)

(v) Describe the reason it is desirable to have the electrons moving at right angles to the magnetic field.

(2 marks)

(Total: 25 marks)

~The End~