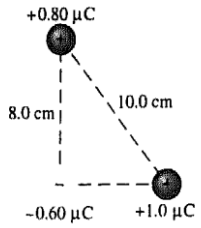
Department of Higher Education
University of Computer Studies, Yangon
First Year (B.C.SC./B.C.Tech.)
Final Term Examination
Physics
September, 2018

Answer all Questions. **Time allowed:3hours**

1. (a) What do you understand Coulomb's law in words? (4 Marks)

(b) Three point charges are fixed in place in a right tringle (Figure).What is the electric force on the -0.60 μC charge due to the other two charges? (8 marks)



(c) What are the magnitude and direction of the electric field midway between two point charges, -15 μC and +1μC, which are 8.0cm apart? (8 Marks)

2. (a) Define Electric Potential. Write down the mathematical expression for electric potential energy due to three points charge. (4 Marks)

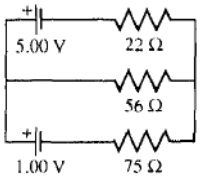
(b) Find the electric potential energy for the following array of charges; charge q_1= +4.0μC is located at (x, y = (0.0 , 0.0) m; charge q_2= +3.0μC is located at (4.0,3.0) m; and charge q_3= **-** **1**.0 μC is located at (0.0,3.0) m. (8 Marks)

(c) An electron is accelerated from rest through a potential difference ΔV. If the electron reaches a speed of 7.26×10^6 m/s, What is the potential difference? Be sure to include the correct sign (does the electron move through an increase or a decrease in potential? (8 Marks)

3. (a) How do you mean electric current? If electron moves to left in a metal wire, how is the direction of the current.? (4 Marks)

(b) Two wires of cross-sectional area 1.6 mm^2 connect the terminals of a battery to the circuitry in a clock. During a time interval of 0.04 s, 5×10^{14} electrons move to the right through a cross section of one of the wires.(Actually, electrons pass through the cross section in both directions; the number that crosses to the right is 5×10^{14} more than the number that crosses to the left.) What is the magnitude and direction of the current in the wire? (8 Marks)

(c) Find the current in each branch of the circuit of Figure .Specify the direction of each. (8 Marks)



4. (a) What is the magnetic dipole? The magnetic field lines are always closed loops. Why? (4 Marks)

(b) In a mass spectrometer, a beam of ^{6}Li and ^{7}Li ions passes through a velocity selector so that the ions all have the same velocity. The beam then enters a region of uniform magnetic field. If the radius of the orbit of the ^{6}Li ion is 8.4 cm, what is the radius of the orbit of the ^{7}Li ions? (8 Marks)

(c) A proton cyclotron uses a magnet that produces a 0.06 T field between its poles. The radius of the dees is 24 cm. What is the maximum possible kinetic energy of the protons accelerated by this cyclotron? (8 Marks)

5. (a) State the condition for interference. (4 Marks)

(b) A uniform magnetic field points north; its magnitude is 1.5 T. A proton with kinetic energy 8×10^{-13} J is moving vertically downward in this field. What is the magnetic force acting on it? (8 Marks)

(c) The solar panels on the roof of a house measure 2 m by 6 m. Assume they convert 35% of the incident EM wave's energy to electrical energy. (a) What average power do the panels supply when the incident intensity is 1 kW/m^2 and the panels are perpendicular to the incident light? (b) What average power do the panels supply when the incident intensity is 0.4 kW/m^2 and the light is incident at an angle of 60º from the normal?

(c) Take the average daytime power requirement of a house to be about 2 kW. How do your answers to (a) and (b) compare? What are the implications for the use of solar panels? (8 Marks)

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<u>Useful data</u>

Mass of ^{6}Li = 6.015u

Mass of ^{7}Li = 7.016u

Resistivity of copper = 1.67×10^{-8} Ωm

Resistivity of aluminum = 2.65×10^{-8} Ωm

1u = 1.66×10^{-27} kg

k = 9×10^{9} N m^{2}C^{-2}

Charge of electron = -1.6×10^{-19} C

Mass of electron = 9.1×10^{-31}kg

$\alpha = 0.4 \times 10^{-3}$ C$^{\circ-1}$

Charge of proton = 1.6×10^{-19} C

$\mu_0 = 4\pi \times 10^{-7}$ T.mA^{-1}

ϵ_0 = 8.85 x 10-12 C^{2}N^{-1}m^{-2}

Velocity of light c = 3×10^{8} ms^{-2}