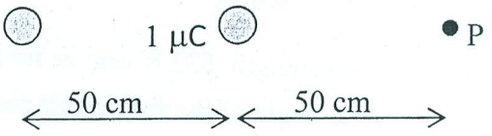
Manoura University
Faculty of Engineering
Building & Construction Engineering Program
Spring Semester 2012/2013
Course Title: Physics-2
Course Code: *PHYS013*

Final Exam (50%)
Time: 2 hours
Date : 2nd Jun 2013

Answer All Questions

Questions No. 1: (12 Marks)

1-a) According to the Fig. shown, consider the electric field at point P is zero. (i) What is sign and magnitude of the charge q? (ii) What is potential at the point P? (4 Degrees)



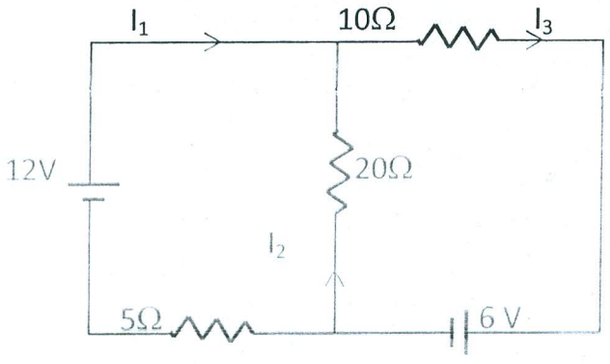
1-b) For a thin spherical shell of radius **R** and charge **Q**, plot both of the electric field, **E**, and electric potential, **V**, versus the distance, **r**, from the sphere's center. (4 Degrees)

1-c) A charged thin sphere of 10 nC charge. The maximum value of the potential due to this charge is found to be 450 V (i) What is the electric field at 15 cm and at 30 cm from the center? (ii) What is the potential at the center of the sphere? Take $K=9\times10^{9}$ Nm^2/C^2. (4 Degrees)

Questions No. 2: (13 Marks)

2-a) A parallel-plate capacitor of capacitance 2×10^{-11} F is connected with 12 V battery, (i) calculate the charge and the energy stored on the capacitor. (ii) If the battery is then disconnected and a slap of dielectric material of k = 5 is inserted between the plates, calculate the energy stored on the capacitor after inserting the dielectric. (5 Degrees)

2-b) Consider the circuit in the figure shown. Find the currents I_1, I_2 and I_3. (4 Degrees)



2-c) An electron of kinetic energy 400 eV moves perpendicular to a uniform magnetic field of intensity 0.02 T. Calculate the radius and the period of its orbit. For electron, take $m = 9.1\times10^{-31}$ Kg and $e = 1.6\times10^{-19}$ C. (4 Degrees)

Masoura University | Faculty of Engineering
Building and Construction Engineering (BCE) Program | Total Grade: 50 marks
PHYS013 | Final Exam. | Date: 10- 1 – 2015

Question 1 (12 marks)

a- Describe the construction of Fresnel's biprism experiment. (وضح الاجابة بالرسم) *(4 marks)*

b- When light of wavelength 513nm illuminates two slits separated by 0.5 mm, five dark fringes per centimeter are seen on a screen. **(i)** What is the distance from the slits to the screen. **(ii)** At what distance from the center of a double-slit pattern does the intensity first fall to 50% of the central maximum. *(4 marks)*

c- A thin film of plastic (n=1.56) is 1.25 μm thick. It is sandwiched between two glass slabs with refractive indices of 1.58 and 1.52, respectively. White light (400-700nm) is first incident normally on the slab for which n=1.58.What is the minimum wavelength that will be missing. *(4 marks)*

Question 2 (20 marks)

a- Compare between (وضح الاجابة بالرسم) *(4 marks)*

(i) Intermodal dispersion and Chromatic dispersion.

(ii) Multi Graded index and Multi step index optical fiber.

b- A polarized light is directed in the vertical direction. The light passes through two polarizers, which have polarizing angles of 35° and 55° from the vertical. What is the intensity of the transmitted light? (وضح الاجابة بالرسم) *(4 marks)*

c- What is the meaning of the following statements? (وضح الاجابة بالرسم) *(8 marks)*

(i) The Numerical aperture (N.A.) of the optical fiber is 0.4 .

(ii) The measured length of a rod is improper.

(iii) A sheet of plastic is optically active.

(iv) The polarized angle for two mediums is 40°.

d- Two rockets, A and B, approach each other with speeds of 0.9C relative to the earth. What is the velocity of A relative to B? *(4 marks*

Question 3 (18 marks)

a- By using Gauss's law **(i)** Calculate the electric field due to charged spherical shell of radius R and total charge Q. **(ii)** Draw the relation between E and r. *(6 marks)*

b- A point particle with charge q = 4.5 μC is placed at x = -10 cm and a second particle of charge Q = 6.7 μC is placed on the x axis at x = +25cm **(i)** What is the magnitude of the total electrostatic force on a third particle – 3.8 μC placed at the point (10cm, 10cm)? **(ii)** Calculate the electric field at that point. *(6 marks)*

c- An electron gun in the picture tube of a television set accelerates electrons from rest to a speed of 4.0×10^{7} m/s along a distance of 1.0 cm. What is the magnitude of the uniform electric field used by the gun. [$e = 1.6\times10^{-19}$ C, $m = 9.11\times10^{-31}$kg] *(6 marks)*

Dr. Mervat Abo-Elkhier