Manoura University
Faculty of Engineering
Building & Construction Engineering Program
Summer course 2013/2014
Course Title: Physics-2
Course Code: PHYS013

Final Exam (50%)
Time: 2 hours
Date : 31th Aug 2014

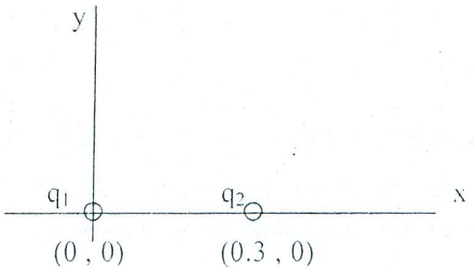
Answer All Questions

Questions No. 1: (12 Marks)

1-a) Write down only the mathematical relation of the followings: (i) Gauss' law. (ii) The relation between electric potential and electric field, (iii) The relation between electric potential difference and potential energy difference. (iv) The relation between magnetic force and magnetic field.
(4 Degrees)

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

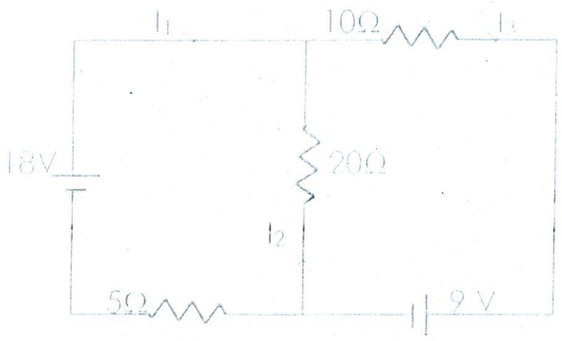
1-c) According to the Fig. shown, where, the coordinates are in meters, if q_1 is 1 μC and q_2 is - 4μC, find the coordinates of the point at which the electric field is zero. (4 Degrees)



Questions No. 2: (13 Marks)

2-a) A parallel-plate capacitor of capacitance 4×10^{-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 1000 eV moves perpendicular to a uniform magnetic field of intensity 0.01 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)

Questions No. 3: (9 Marks)

3-a) Write down, with illustrating sketch مع التوضيح بالرسم, the mathematical expression of the maximum acceptance angle of step-index optical fibre. (4 Degrees)

3-b) Sketch the Michelson's interferometer. (2 Degrees)

3-c) Concerning the interaction of radiation with matter, explain with illustrating sketch, the followings; (i) absorption, (ii) spontaneous emission and (iii) stimulated emission. (3 Degrees)

Questions No. 4: (16 Marks)

4-a) A thin sheet of transparent material ($n = 1.6$) is placed in the path of one of the interfering beams in a biprism experiment using a light of wavelength of 500 nm. The central fringe shifts to a position normally occupied by the 10^{th} bright fringe. Calculate the thickness of the sheet. (4 Degrees)

4-b) Monochromatic light of wavelength 450 nm is incident normally on a diffraction grating containing 6000 lines/cm. Find the angle of the first-order maximum. (4 Degrees)

4-c) In using a polarizer and analyzer in the polarization experiment, the intensity of the final light beam is 12.5% of that of the initial beam (before transmission through the polarizer). Calculate the angle between the transmission axes of the analyzer and polarizer. (4 Degrees)

4-d) An electron moves with a speed of 0.9c. Find its total energy and kinetic energy in MeV. Take, for the electron, $m = 9.1\times10^{-31}$ Kg and $e = 1.6\times10^{-19}$ C and the speed of light is 3×10^{8} m/s.

(4 Degrees)