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

Final Exam (50%)
Time: 2 hours
Date : 22th Aug 2013

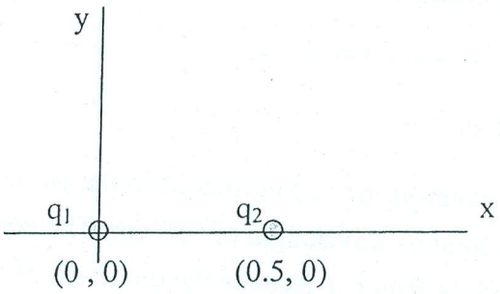
Answer All Questions

Questions No. 1: (12 Marks)

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

1-b) For a thin spherical shell of radius **R** 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)

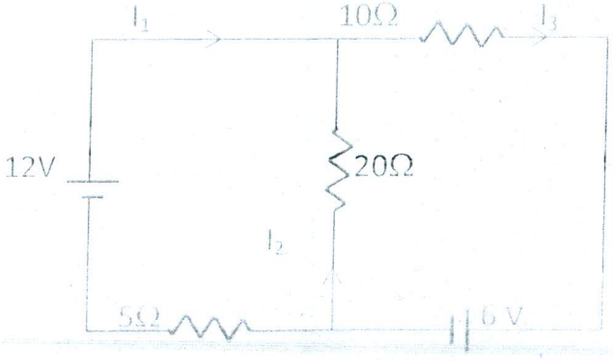
1-c) According to the Fig. shown, where, the coordinates are in meters, if q_1 is 1 μC and q_2 is - 4μC, find the coordinates of the point at which the electric field is zero. (4 Degrees)



Questions No. 2: (13 Marks)

2-a) A parallel-plate capacitor of capacitance 5×10^{-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 = 6 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 500 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 = 9.1×10^{-31} Kg and e = 1.6×10^{-19} C. (4 Degrees)

Questions No. 3: (9 Marks)

3-a) Define with illustrating sketch the phenomena of total internal reflection. (2 Degrees)

3-b) Write down the mathematical expression of the maximum acceptance angle of step-index optical fibre. (2 Degrees)

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

3-d) 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 = 1.5) 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 632.8 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 0.95c. Find its total energy and kinetic energy in MeV. Take, for the electron, m = 9.1×10^{-31} Kg and e = 1.6×10^{-19} C and the speed of light is 3×10^{8} m/s.

(4 Degrees)