Mansoura University
MTE – BME Programs
Subject : PHYS013
Date : 9 - 6 – 2016

Faculty of Engineering
Level : 000
Time Allowed: 2 hrs.
Total Grade : 50 marks
No of pages : 2 pages

ملاحظات هامة: ١- عدم الخلط بين إجابات أسئلة الضوء وإجابات أسئلة الكهربية
٢- عدم استخدام ورقة الرسم البيانى فى الكتابة أو الرسم

Question 1: (12 marks) (وضح اجابتك بالرسم)

(a) A laser beam is traveling through an unknown substance. When it falls on a boundary with air, the angle of reflection is 25.0° and the angle of refraction is 37.0°. **(i)** What is the index of refraction of the substance? **(ii)** At what minimum angle of incidence would the light be totally internally reflected? *(4 marks)*

(b) A double slit is illuminated with monochromatic light of wavelength 600.0 nm. The m = 0 and m =1 bright fringes are separated by 3.0 mm on a screen 40.0 cm away from the slits. **(i)** What is the separation between the slits? **(ii)** What is the intensity at distance 3.5 mm from the center on the screen? *(4 marks)*

(c) A transparent film (n =1.3) is deposited on a glass lens (n = 1.5) to form a nonreflective coating. What is the minimum thickness that would minimize reflection of light with wavelength 500.0 nm in air? *(4marks)*

Question 2: (14 marks) (وضح اجابتك بالرسم)

(a) What will happen if *(8marks)*

(i) Polarized light is incident on Liquid crystal (LCD).
(ii) Light is incident on an optical fiber by an angle greater than the acceptance angle.
(iii) Light beam is incident on two crossed polarizer.
(iv) If the intermodal dispersion is eliminated (يستبعد) in the optical fiber.

(b) A rocket ship approaching Earth at 0.9C fires a missile toward Earth with a speed of 0.5C, relative to the rocket ship. As viewed from Earth, how fast is the missile approaching Earth? *(2 marks)*

(c) A body has a mass of 12.6kg and a speed of 0.87C, **(i)**What is the magnitude of its momentum? **(ii)** Find the kinetic energy of the body. *(4 marks)*

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$m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C, $K = 9 \times 10^9$ Nm^2/C^2, $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m. $m_p = 1.6 \times 10^{-27}$ kg

3-a (i) **Write** the properties of conductors in electrostatic equilibrium, **Write** the properties of electric charge. *(3 marks)*

3-b- A proton accelerates from rest in a uniform electric field of 640 N/C. At some later time, its speed is 1.20×10^6 m/s. (a) Find the magnitude of the acceleration of the proton. (b) How long does it take the proton to reach this speed? (c) How far has it moved in this interval? (d) What is its kinetic energy at the later time? *(3 marks)*

Question four: electricity *(ضع نتائج المسائل فى جدول)*

4-a- Four closed surfaces, S_1 through S_4, together with the charges - 2 Q, Q, and - Q are sketched here. Find the electric flux through each surface. $Q = 45\mu C$, *fig. 4-a* *(3 marks)*

4-b- Draw the electric field lines and equipotential surfaces for (i) positive point charge, (ii) solid conducting sphere negatively charged, (iii) uniform electric field. ممنوع ورق الرسم البيانى *(3 marks)*

Question five electricity *(ضع نتائج المسائل فى جدول)*

5-a- Two spherical conductors of radii *4cm* and *7 cm* are separated by a distance much larger than the radius of either sphere. The sphere charges are initially $q_1 = +2.0$nC and $q_2 = -5.0$nC. After that the spheres are connected by a conducting wire. Find the electric potential and the electric field strengths at the surfaces of the spheres. *(3 marks)*

5b-Derive the capacitance for a spherical capacitor consists of a spherical conducting shell of radius *b* and charge *-Q* that is concentric with a smaller conducting sphere of radius *a* and charge *+Q*.. If $a = 2$ mm, $b = 5$ *mm,* and $Q = 45\mu C$, **calculate** the capacitance of this capacitor and **calculate** the electric field at $r = 1mm, 3mm$ *and 7 mm.* **What** is the value of the potential difference between *a* and *b*? *(4 marks)*

Question six: electricity *(ضع نتائج المسائل فى جدول)*

6-a- **Determine** the current in each branch of the circuit figure 6-a *(3 marks)*

6-b-For the circuit shown ***fig. 6-b.,*** find (a) the equivalent capacitance, (b) the charge and potential difference for each capacitor. *(3 marks)*

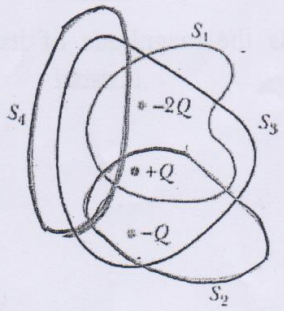

figure 4-a-.

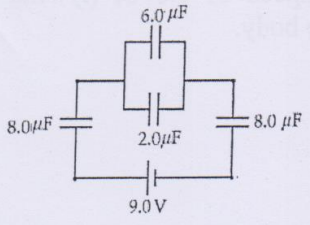

figure 6-a-.

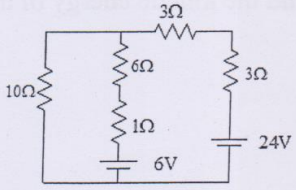

figure 6-b-

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