اعدادى (٦)

University : Menoufia *Faculty : Electronic Engineering* *Department : Physics and Engineering Maths* *Academic level : preparatory* *Course Name : Physics 2* *Course Code :* *Academic Year : 2018-2019*	جامعة المنوفية	*Date : 16/6/2019* *Time : 3 Hours* *No. of Papers : 1(Two Faces)* *No. of Questions : 6* *Full Mark : 90 Marks* *Exam : Final Exam.* *Examiner :* Prof. Dr. Mohamed Dawoud Dr. Mohamed Said Shams

تعليمات هامة: ١ـ لا تكتب بالقلم الرصاص.

٢ـ ابدأ من جهة اليمين أجابة الكهربية اولا ثم المغناطيسية بالترتيب.

Constants

$\varepsilon_o = 8.85\times10^{-12}\ C^2/N.m^2$ $\quad \mu_o = 4\pi\times10^{-7}\ T\ m/A$ $\quad |e| = 1.6\times10^{-19}\ C$

$m_p = 1.67\times10^{-27}\ kg$ $\quad m_e = 9.1\times10^{-31}\ kg$

Answer all the following questions: ***Part 1 (Electricity)***

Question No 1: (15 Marks)

[1-a] *Define the following quantites and state their units: Electric flux, Electric dipole, Electric potential, Capacitance, Dielectric constant.* [5 Marks]

[1-b] ***Fig. 1*** *shows an arrangement of four charged particles, with angle* $\theta = 30.0°$ *and distance* $d = 2.00$ *cm. Particle 2 has charge* $q_2 = +8.00 \times 10^{-19}$ *C; particles 3 and 4 have charges* $q_3 = q_4 = -1.60 \times 10^{-19}$ *C. What is distance D between the origin and particle 2 if the net electrostaticforce on particle 1due to the other particles is zero?* [10 Marks]

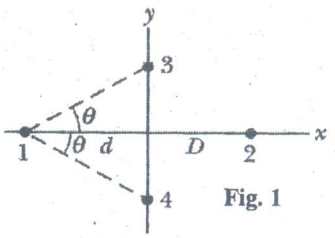

Fig. 1

Question No 2: (15 Marks)

[2-a] ***Fig. 2*** *shows a ring of radius* ***R*** *carries a uniformly distributed positive total charge* ***Q****. Calculate the electric field due to the ring at a point* ***P*** *lying a distance* ***Z*** *from its center along the central axis perpendicular to the plane of the ring.* [5 Marks]

[1-b] *Two equal positive charges are at opposite corners of a trapezoid (شبه منحرف) as shown in* ***Fig.3****. Find the horizontal and vertical components of the electric field at the point P in terms of (بدلالة) d and Q.* [10 Marks]

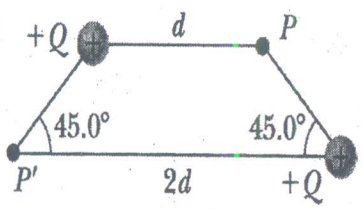

Fig. 3

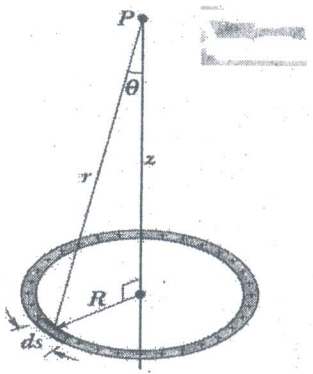

Fig. 2

Question No 3: (15 Marks)

[3-a] *A Spherical capacitor is formed of a central cross section of a capacitor that consists of two concentric spherical shells, of radii a and b, where b>a. Prove that* $C = 4\pi\varepsilon_o \frac{ab}{b-a}$ *[5Marks]*

[2-b] *The space between two concentric conducting spherical shells of radii b =1.70 cm and a =1.20 cm is filled with a substance of dielectric constant k=23.5. A potential difference V=73 V is applied across the inner and outer shells. Determine (i) the capacitance of the device, (ii) the free charge q on the inner shell.* [10 Marks]

Part 2(Magnetism)

Question No 4: (15 Marks)

[4-a] *List* ***in details*** *several similarties and differences between the following:*

i) Coloumb's law & Biot-Savart law.
ii) Gauss' law & Ampere's law.
iii) Electric dipole moment & Magnetic dipole moment.
iv) Electric force & Magnetic force.
v) Gauss' law in electricity & Gauss' law in magnetism. [5 Marks]

[4-b] *A proton travels with a speed of* 3×10^6 *m/s at an angle of* 37.0° *with the direction of a magnetic field of* 0.300 *T in the +y direction. What are (a) the magnitude of the magnetic force on the proton and (b) its acceleration?* [10 Marks]

Question No 5: (15 Marks)

[5-a] *Consider a thin, straight wire carrying a constant current I and placed along the x axis as shown in* ***Fig.4****. Determine the magnitude and direction of the magnetic field at point P due to this current.* [5 Marks]

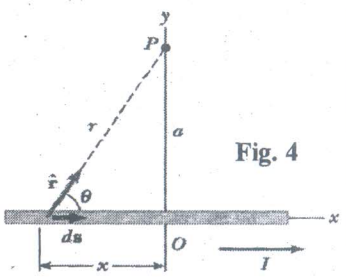

Fig. 4

[5-b] ***Fig. 5*** *shows two current segments. The lower segment carries a current of* i_1 =0.40 *A and includes a semicircular arc with radius* 5.0 *cm, angle* 180°, *and center point P. The upper segment carries current* $i_2 = 2i_1$ *and includes a circular arc with radius* 4.0 *cm, angle* 120°, *and the same center point P.* ***(a)*** *What are the the magnitude and direction of the net magnetic field at P for the indicated current directions?* ***(b)*** *What are the the magnitude and direction if* i_1 *is reversed?* [10 Marks]

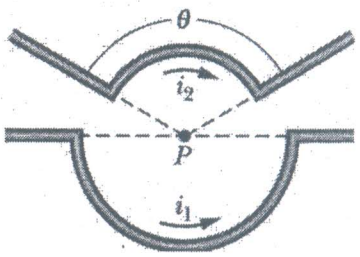

Fig. 5

Question No 6: (15 Marks)

[6-a] *Define the following quantites and state their units: Magnetic field, Magnetic flux, Magnetic dipole, Time constant and Self inductance.* [5 Marks]

[6-b] *Calculate the resistance in an RL circuit in which L=2.5H and the current increases to* 90% *of its final value in* 3 s? [10 Marks]

With best wishes for success