Menoufiya University
Faculty of Engineering
Shebin El-Kom
Second Semester Exam.
Academic Year: 2015-2016

Department: Basic Science of Engineering
Year: Preparatory year
Subject/Code: **Physics 1B** (BES022)
Time Allowed: **3 hours**
Date: **6/6/2016**

Answer the Following Questions: (75 *marks*)

(((يجب إجابة كل جزء مُنْفَصِل عن الآخر. الإمتحان 5 أسئلة موزعة على 3 ورقات)))

Part 1

Question 1: (12 *marks*)

a) Describe and explain the magnetic force on a charged particle in a uniform magnetic field.

b) Determine the periodic time of a charged particle is moving circular motion in a uniform magnetic field.

c) A positive charged particle has mass 2×10^{-24} *gm* and charge 1.6×10^{-19} *C* is sent into a region of uniform magnetic field oriented perpendicular to the charged particle's path. The charged particle travels at a speed 8×10^{10} *cm/sec* in a circular path of radius 2 *m*. What is the magnitude of magnetic field?

Question 2: (13 *marks*)

a) Determine and explain the magnetic force between two parallel wires have length L, carry a current I_1 & I_2 and a distance "d" between them.

b) Determine the relation between magnetic permeability of a material inserted in a solenoid and magnetic permeability of free space.

c) Prove that the magnetic energy density stored in an inductor is directly proportional to the square of magnetic field.

d) Determine the frequency of oscillation in LC-circuit.

Part 2

Question 3: Choose the correct answer(s), (25 *marks*)

أكتب الإختيارات الصحيحة بدون كتابة السؤال
أكتب التوصيح المناسب لسبب إختيارك

a) An electric dipole is placed freely in a region known to contain a uniform electric field. After an adequate كافى time, the **electric dipole moment (*p*)** .....

i) points يشير parallel to the field lines.
ii) makes an angle $0 \le \theta \le \frac{1}{2}\pi$.
iii) points normal عمودى to the field lines.
iv) remains constant.
v) rotates anticlockwise عكس عقارب الساعة

b) **An electron (*e*)** enters a region of uniform electric field (E), after a short time (t) it stops momentarily لحظياً. Chose the correct statement(s) (الجُمَل) الجُملة of the following .....

i) The acceleration of the motion (a) is positive during خلال this stage مرحلة.
ii) The electron travels parallel to the field lines during this stage.
iii) The effective فعّال electric force (F) is parallel to the field lines during this stage.
iv) The effective فعّال electric force is given as $F = e\,E$ during all stages.
v) The potential energy difference (ΔU) is negative.

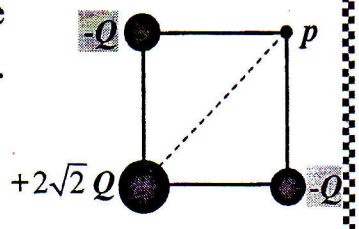
c) If the distance between two charged particles is doubled ($r_{final} = 2\ r_{initial}$), and the charge on one of them is reduced to one-third (⅓) of its original أصلى value ($q_{final} = ⅓\ q_{initial}$), **the resultant electric force will be** F_{final} = ...$F_{initial}$.

i) 1/6 ii) 2/24 iii) 1/36 iv) 1/18 v) 1/7

d) A conducting sphere of radius "a", total charge $+Q$, and charge density $+\sigma$. The electric field at a point just outside the sphere (at the outside surface) is E = ...

i) $4\pi k\sigma$ ii) $kQ/2a$ iii) $\sigma/2\varepsilon_o$ iv) kQ^2/a^2 v) σ/ε_o

e) Three charged particles are arranged on corners of a square as shown in the figure. **The electric field** at point "p" is.....

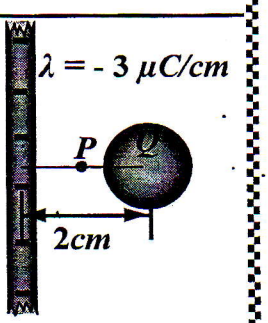


i) upward and to the right.↗ ii) straight to the right.→

iii) straight downward.↓ iv) zero.

v) downward and to the left.↙

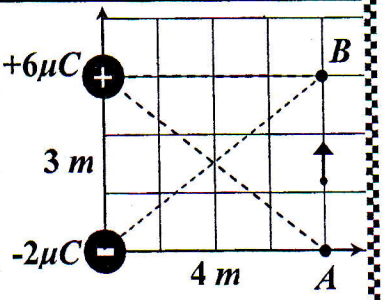
f) The figure represents **charged sphere** of total charge Q, and **wire of infinite length** of uniform charge density $\lambda = -3\ \mu C/cm$. The electric field at point "P"; midway منتصف الطريق between them is zero. The value of Q = ...



i) $+12\ \mu C$. ii) $+6\ \mu C$. iii) $-3\ \mu C$.

iv) $-12\ \mu C$. v) $-6\ \mu C$.

g) In the figure: the **potential energy difference** (ΔU) when the electron ($e = -1.6\times10^{-19} C$) moves from point A to point B equals...



i) $+05.760\times10^{-16} J$ ii) $-05.760\times10^{-16} J$

iii) $+15.84\times10^{-16} J$ iv) $-15.84\times10^{-16} J$

v) $-10.08\times10^{-16} J$

h) The figure represents يوضح **two conducting spheres** كُرَتَين "A & B" each of them carries - 8 nC charge. The surface area of "B" is one-third (⅓) that of "A". After touching them together; the number of electrons ($e = -1.6\times10^{-19} C$) that leave sphere "B" and move to "A" equals .....

i) $+2.5\times10^{10}$ *electron.* ii) $+5.0\times10^{10}$ *electron.*

iii) $+7.5\times10^{10}$ *electron.* iv) zero.

v) $+12.5\times10^{10}$ *electron.*

i) A metallic coin عُملة is given a **negative electric charge**. Its mass will .....

i) remain unchanged.

ii) decrease by an amount too small to measure directly.

iii) increase by an amount too small to measure directly.

iv) decrease measurably بشكل محسوس.

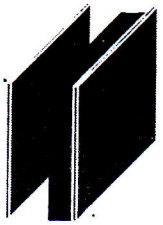
v) increase measurably

Part 3

Question 4: (12 marks)

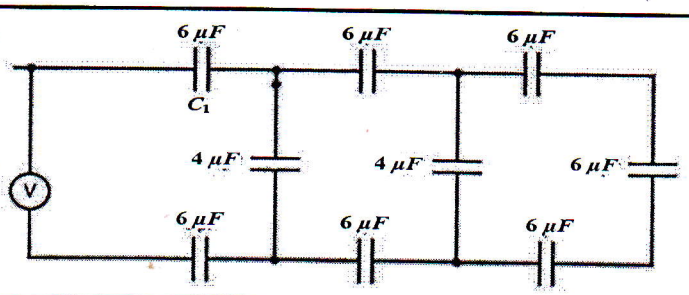
a) Derive an equation for the capacitance of a cylindrical capacitor.

b) Charged parallel-plate capacitor of charge 30 μC, plate area $A = 1\times10^{-4}\ m^2$ and plate separation $d = 2\times10^{-3}\ m$ is half filled with a dielectric material of dielectric constant $K = 2$ as shown in the figure. Calculate the energy stored in this capacitor. $\varepsilon_0 = 8.85\times10^{-12}\ C^2/N.m^2$.



c) i) Find the equivalent capacitance of the given circuit

ii) Calculate the charge on the capacitor $C_1 = 6\ \mu F$ if $V = 10\ V$



Question 5: (13 marks)

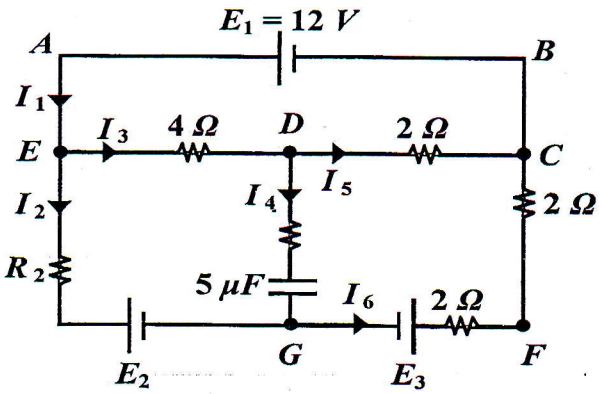
a) **What is the meaning of .....**

i) light source of power loss 100 W

ii) a wire carries a current 5 A

b) A series AC circuit contains the following components: $R = 150\ \Omega$, $L = 250\ mH$, $C = 2\ F$ and a source with $V_{max} = 210\ V$ operating at 50 Hz. Calculate the maximum current (I_{max}) and the power factor of the circuit.

c) For the circuit shown, if $I_2 = 1A$ calculate I_3, I_1, I_4, I_5 and I_6.



This exam measures the following ILOs

Question Number	Q1 (a)	Q1 (b)	Q2 (a)	Q2 (b)	Q3 (c)	Q3 (a,b,i)	Q4 (a)	Q5 (a)	Q2 (c)	Q3 (f, g)	Q3 (d, e)	Q4 (b)	Q5 (b)	Q1 (c)	Q2 (d)	Q3 (h)	Q4 (c)	Q5 (c)
Skills	a1-1	a1-2	a2-1	a2-2	a2-1	a1-1	A1-1	a2-1	b4-1	b2-1	b4-1	b4-1	b2-1	c9-1	c9-1	c4-3	C9-1	c4-3
	Knowledge &Understanding Skills								Intellectual Skills					Professional Skills				

With our best wishes