



COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Basic and Applied Science

Lecturers : Prof.Dr. Mohamed Abd Elzaher and Dr. Ali Attia

Course : Physics 1

Course Code : BA113

Date : 07/06/2014

Marks: 40

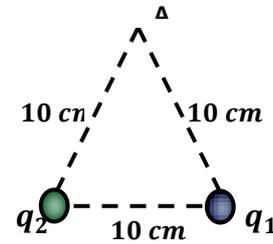
Time : 2 hours

Final Exam

Answer the following Questions

Question 1

a. Two point charges are located as shown in the figure, if $q_1 = +10 \mu\text{C}$ and $q_2 = -10 \mu\text{C}$ Find:
The total electric field at the apex (A) of the triangle.



(3 marks)

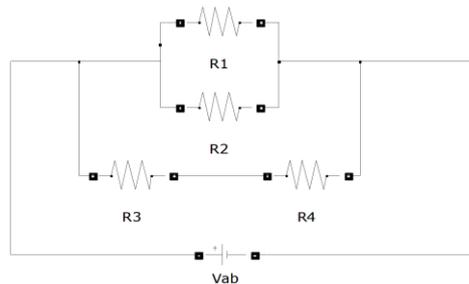
b. A rectangular coil of dimension $5.4 \text{ cm} \times 8.5 \text{ cm}$ consists of 25 turns of wire and carries a current of 15 mA. A 0.35 T magnetic field is applied parallel to the plane of the coil. What is the magnitude of the torque acting on the loop?

(3 marks)

c. Four resistors $R_1 = 4 \Omega$, $R_2 = 6 \Omega$, $R_3 = 8 \Omega$ and $R_4 = 10 \Omega$ are connected as shown in the figure below. A potential difference of 12 V is applied between point (a) and point (b).

Calculate:

- The total resistance.
- The current in each resistor.



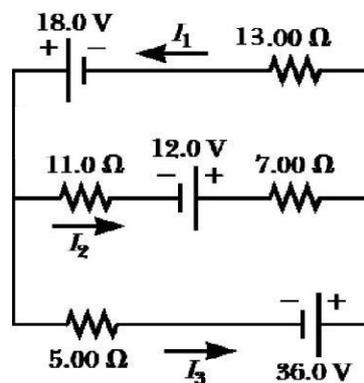
(4 marks)

{A5,C1}

[Total 10 marks]

Question 2

a. In the circuit of the figure below, calculate the current in each branch by using Kirchhoff's Laws.



(5 marks)

b. A metal wire has a resistance of 25.00Ω under room temperature conditions of 25°C . When the wire is heated to 85°C the resistance increases to 25.75Ω . What is the temperature coefficient of resistivity of this metal?

(3 marks)

- c. An uncharged $20 \mu\text{F}$ capacitor and a $12 \times 10^5 \Omega$ resistor are connected to a battery ε of 16 V . Find:
- The time constant of the circuit.
 - The maximum charge on the capacitor, the maximum current in the circuit.
 - The charge and current as a function of time.

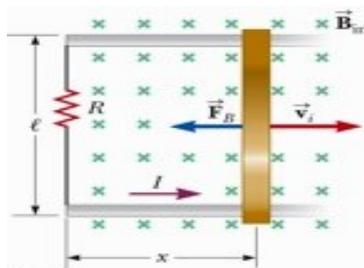
{A5,C1}

(2 marks)

[Total 10 marks]

Question 3

- A long solenoid that has 1000 turns is distributed uniformly over a length of 0.400 m produces a magnetic field of magnitude $1.00 \times 10^{-4} \text{ T}$ at its center. What current is required in the windings for that to occur? (2 marks)
- The figure below shows a top view of a bar that can slide on two frictionless rails. The resistor is $R = 9.00 \Omega$ and a 3 T magnetic field is directed perpendicularly downward, into the paper. Let, $\ell = 1.20 \text{ m}$. Calculate the applied force required to move the bar to the right at a constant speed of 4.00 m/s .



(4 marks)

- Light of wavelength 530 nm illuminates a pair of slits separated by 0.300 mm . If a screen is placed 2.00 m from the slits, determine the distance between the first and second dark fringes. (4 marks)

{A1,C1}

[Total 10 marks]

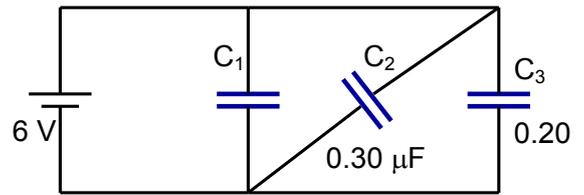
Question 4

I. Choose the correct answer:

- Electric heater is constructed by applying a potential difference of 110 V across a wire with a resistance of 5.0Ω . What is the power rating of the heater?
 - 2.0 kW
 - 2.4 kW
 - 1.7 kW
 - 60 kW
- Two resistors R_1 and R_2 are connected in parallel, the equivalent resistor (R_{eq}) is
 - $R_{\text{eq}} = R_1 \times R_2$
 - $R_{\text{eq}} = R_1 + R_2$
 - $\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2}$
 - $\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} \times \frac{1}{R_2}$
- A flat surface of area 3.2 m^2 is rotated in a uniform electric field of magnitude $E = 6.5 \times 10^4 \text{ N/C}$. The electric flux through this area, when the electric field is perpendicular to the surface is:
 - $0 \text{ Nm}^2/\text{C}$
 - $2.031 \times 10^4 \text{ Nm}^2/\text{C}$
 - $20.8 \times 10^4 \text{ Nm}^2/\text{C}$
 - $66.5 \times 10^4 \text{ Nm}^2/\text{C}$

d. For the arrangement of three capacitors shown in the diagram below, what value of C_1 will give a total equivalent capacitance of $1.7 \mu\text{F}$?

- i. $2.2 \mu\text{F}$
- ii. $1.2 \mu\text{F}$
- iii. $0.13 \mu\text{F}$
- iv. $0.5 \mu\text{F}$



(6 marks)

II. Two parallel wires separated by 6 cm repel each other with a force per unit length of $4 \times 10^{-4} \text{ N/m}$. The current in one wire is 5 A.

- i. Find the current in the other wire.
- ii. Are the current in the same direction or in opposite direction?

(4 marks)

{B2,C1} [Total 10 marks]

$\mu_0 = 4\pi \times 10^{-7} \text{ Tm/A}$, $k = 9 \times 10^9 \text{ N.m}^2/\text{c}^2$, $\epsilon_0 = 8.85 \times 10^{-12} \text{ c}^2/\text{Nm}^2$
 mass of the electron = $9.1 \times 10^{-31} \text{ Kg}$, charge of electron = $1.6 \times 10^{-19} \text{ C}$.

Members of Course Examination Committee	Signature	Date
Prof. Mohamed Abd Elzaher		
Dr. Eman Shafik		
Dr. Aly Abdel-Moneim		

GOOD LUCK