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University of Jordan **Second Exam** **Physics 102** **December 5, 2018**

الرقم الجامعي: .

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التسلسل: 45

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Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
C	C	D	D	D	D	B	B	E	A	C	C

A E

$\mu_o = 4\pi \times 10^{-7}$ T.m/A

Q1) A long straight wire carrying a 3.0 A current enters a room through a window 1.5 m high and 1.0 m wide.
The path integral $\oint \vec{B} \cdot d\vec{s}$ around the window frame has the value (in T.m):
A) 3.0×10^{-7} B) 2.5×10^{-7} C) 3.8×10^{-6} D) 0.20 E) 4

Q2) Resistances of 2.0 Ω, 4.0 Ω, and 6.0 Ω and a 24-V emf device are all in series. The potential difference (in V) across the 2.0-Ω resistor is:
A) 12 B) 8 C) 4 D) 24 E) 48

Q3) A certain resistor dissipates 0.5 W when connected to a 3 V potential difference. When connected to a 1 V potential difference, this resistor will dissipate (in W):
A) 0.50 B) 0.167 C) 1.5 D) 0.056 E) 15.0

Q4) A charged particle is moving with speed v perpendicular to a uniform magnetic field. A second identical charged particle is moving with speed $2v$ perpendicular to the same magnetic field. If the cyclotron frequency of the first particle is ω, the cyclotron frequency of the second particle is:
A) ω B) 2ω C) 4ω D) $\omega/2$ E) $\omega/4$

Q5) A certain capacitor, in series with a 720-Ω resistor, is being charged. At the end of 10 ms its charge is half the final value. The capacitance is about:
A) 9.6 μF B) 14 μF C) 7.2 μF D) 20 F E) 10 F

Q6) A cylindrical wire has a resistance R and resistivity ρ. If its length and diameter are both cut in half, its resistivity will be:
A) 4ρ B) 2ρ C) $\rho/2$ D) ρ E) $\rho/4$

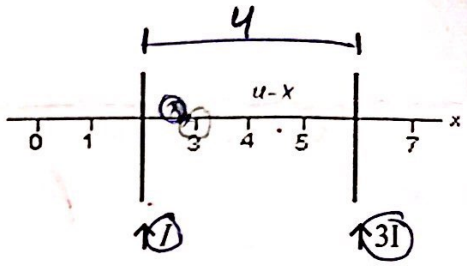
Q7) A charged particle (m = 5.0 g, q = −70 μC) moves horizontally at a constant speed of 30 km/s in a region where the free fall gravitational acceleration is 9.8 m/s² downward, the electric field is 700 N/C upward, and the magnetic field is perpendicular to the velocity of the particle. The magnitude of the magnetic field (in mT) in this region is:
A) 12 B) 47 C) 23 D) 35 E) 0

Q8) Solenoid 2 has twice the radius and six times the number of turns per unit length as solenoid 1. When equal currents are present in the two solenoids, the ratio of the magnetic field in the interior of 2 to that in the interior of 1 is:

A) 1/3 B) 6 C) 2 D) 4 E) 1

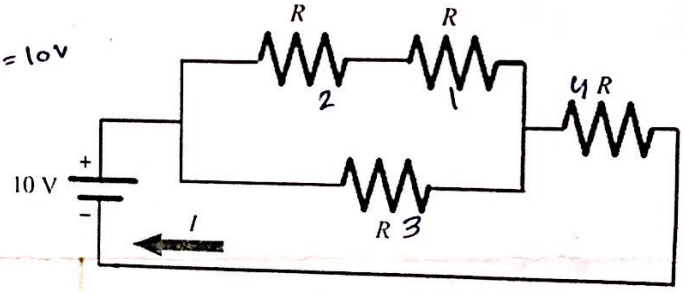
Q9) Two long straight current-carrying parallel wires cross the x axis and carry currents I and $3I$ in the same direction, as shown. The value of x at which the net magnetic field is zero is:

A) 0 B) 1 C) 5
D) 7 E) 3



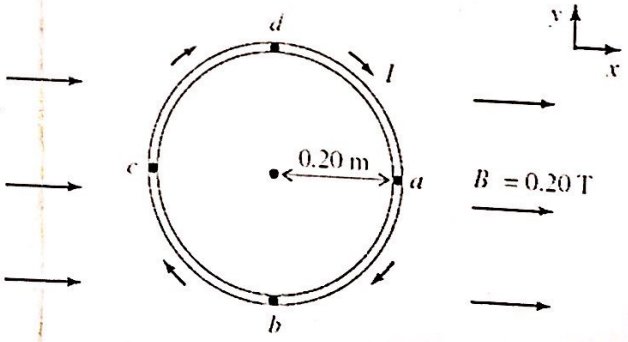
Q10) When four identical resistors are connected to an ideal battery of voltage $V = 10$ V as shown in the figure, the current I is equal to 0.20 A. The resistance R (in Ω) is:

A) 30 B) 20 C) 40
D) 50 E) 10



Q11) A rigid circular loop has a radius of 0.20 m and is in the xy-plane. A clockwise current I is carried by the loop, as shown. The magnitude of the magnetic moment of the loop is 0.75 $A \cdot m^2$. A uniform external magnetic field, $B = 0.20$ T in the positive x-direction, is present. An external torque changes the orientation of the loop from one of lowest potential energy to one of highest potential energy. The work done (in J) by this external torque is closest to:

A) 0.20 B) 0.60 C) 0.40 D) 0.50 E) 0.30



Q12) The current density in a wire of radius R is given by $J = kr$, $0 < r < R$, where k is constant. The current in the wire is:

A) $kR^3/3$ B) $3\pi kR^3/2$ C) $2\pi kR^3/3$ D) $k\pi R^2$ E) $k\pi R^2/2$

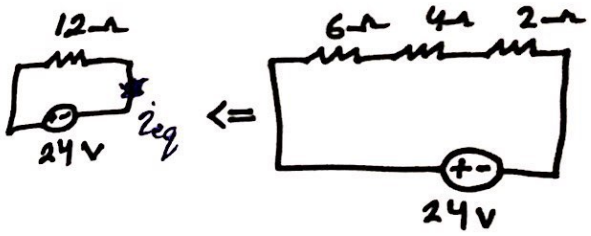
Physics 2
fall 2019.

Q1) $\oint \vec{B}.d\vec{s} = \mu_0 I_{ins}$

$= 4\pi * 10^{-7} * 3$

$= 3.8 * 10^{-6}\ (T.m)$.

Q2) $i_{eq} = \frac{V}{R_{eq}} = \frac{24}{12} = 2A$



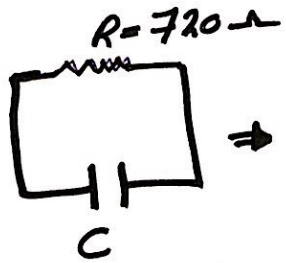
$V_{2\Omega} = i_{eq} R = 2 * 2 = 4V$

Q3) $P = \frac{V^2}{R} \Rightarrow 0.5 = \frac{(3)^2}{R} \Rightarrow R = 18\Omega$

So, $P = \frac{V^2}{R} = \frac{(1)^2}{18} = 0.056\ W$

Q4) (W), ~~does~~ w doesn't depend on V.

Q5)



→ Discharging case.

$\tau = RC$

$0.01443 = 720 * C$

$\boxed{C = 20\mu F}$

take (ln) for both sides →

$q = q_{max} e^{-t/\tau}$

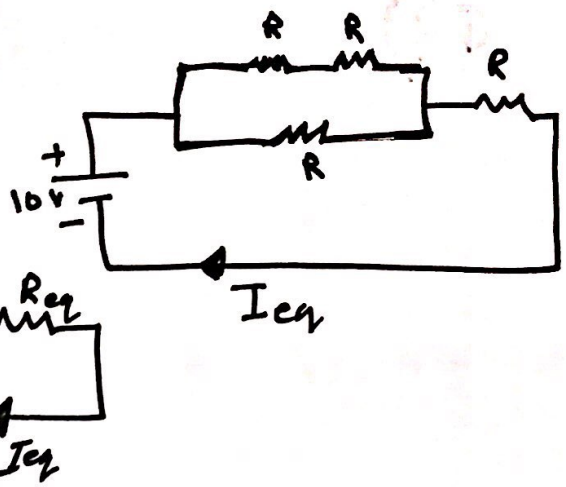
$\frac{1}{2} q_{max} = q_{max} e^{-t/\tau}$

$\frac{1}{2} = e^{-t/\tau}$

$-0.69 = -t/\tau$

$0.69 = \frac{10 * 10^{-3}}{\tau} \Rightarrow \tau = 0.01443$

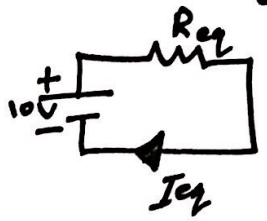
10) $R_{eq} = \frac{5}{3} R$



$\Rightarrow V_{eq} = I_{eq} * R_{eq}.$

$10 = 0.2 * \frac{5}{3} R$

$50 = \frac{5}{3} R \Rightarrow \boxed{R = 30\,\Omega}$



Q11) $U_{min} \longrightarrow U_{max} \quad \theta = 0 \rightarrow 180^\circ$

$\theta = 180^\circ$

$U = mB(1 - \cos\theta)$.

$= 0.75(0.2)(+1 - (-1))$

$= 0.30\ J.$

Q12) $J = \frac{I}{A} \Rightarrow I = \int J.dA$ $\quad A = \pi r^2$, $dA = 2\pi r dr$

$\Rightarrow I = \int_0^R kr.2\pi r dr.$

$2\pi k \int_0^R r^2 dr. = 2k\pi \frac{r^3}{3}\Big|_0^R$

$I = 2\pi k R^3/3.$

Sanfoor_Mohandes_2018

Power_Unit.

Mohammad_ABUHALIMEH

(P) المقاومة بتقل فضيها ،
للسلك وهما تغير شكله .

Q7)

$$F_{tot} = F_E + F_g$$
$$= qE + mg$$
$$= 0.049 + 0.049 = 0.098\ N.$$

$m = 5\ g = 5 \times 10^{-3}\ kg$
$q = -70 \times 10^{-6}\ C.$
$v = 30 \times 10^{3}\ m/s.$
$E = 700\ N/C$

$F_{tot} = q\,VB\sin\theta \Rightarrow \theta = 90^\circ = \boxed{1}$ (BE)

$0.098 = 70 \times 10^{-6} \times 30 \times 10^{3} \times B$

$B = 0.0466 \approx \boxed{47\ mT}$

Q8)

B_2 for sol. 2 $= \mu_0 I n_2$ $\quad n = \frac{N}{L}$
$= \mu_0 I\, 6 n_1$

B_1 for sol. 1 $= \mu_0 I n_1 \Rightarrow \frac{B_2}{B_1} = \frac{\mu_0 I n_1 (6)}{\mu_0 I n_1} = 6.$

Q9)

$B_1 = B_2$

I same direction
⇒ بينهم أقرب للأوفر .

$\frac{\mu_0 I}{2\pi X} = \frac{\mu_0 3I}{2\pi(4-X)}$

$\frac{1}{X} = \frac{3}{4-X}$

$4 - X = 3X$

$4 = 4X$

$\boxed{X = 1}$ ⇒ يعني ع أمثلي من عند (1) (I)

∴ So, B is zero at $\boxed{X = 3}$