Exam 1 Avg: 59.79%

Next Topic: Magnetism

Read Chap 29, 30

#16

\[ E = \frac{A}{R} + V_{\text{meter}} \]

No Current!

#33

\[ R_{\text{eq}} = 40 \Omega \]

\[ I = \frac{120 \text{ V}}{40 \Omega} = 3 \text{ A} \]
\[ I_1 + I_3 = I_2 \]

**Left Loop:**
\[ 22 - 4I_1 - 2I_2 = 0 \]

**Right Loop:**
\[ 24 - 7I_3 - 2I_2 = 0 \]

**Outer Loop:**
\[ 22 - 24 + 7I_3 - 4I_1 = 0 \]

\[ \begin{align*}
22 - 4I_1 - 2I_2 - 2I_3 &= 0 \\
24 - 7I_3 - 2I_1 - 2I_3 &= 0 \\
(22 - 3) - 2I_3 + 3 - 9I_3 &= 0
\end{align*} \]

\[ -50 + 25I_3 = 0 \quad I_3 = 2A \]

\[ 22 - 6I_1 - 2I_2 = 0 \]

\[ 18 - 6I_1 = 0 \quad I_1 = 3A \]

\[ I_2 = 2 + 3 = 5A \]
#27 \( \Phi_E = \frac{q}{\varepsilon_0} = 4\pi \cdot k \cdot q = 1.8 \times 10^{-8} \text{ V} \cdot \text{m} \)

#28

\[ \varepsilon = \frac{F}{A} = \frac{q\varepsilon_0}{4\pi r^2} \]

\[ \varepsilon = \frac{4\pi k \cdot q \cdot \varepsilon_0}{A} \]

\[ = \frac{k \cdot q \cdot \varepsilon_0}{r^2} \]

\[ = \frac{9 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2} \cdot 3 \times 10^{-9} \text{ C}}{(0.06 \text{ m})^2} \]

#18

\[ F_E = m \cdot 0.0136 \text{ kg} \quad q = 0.69 \mu \text{C} \]

\[ F_E = F_g \]

\[ 12 \v E = m \cdot g \]

\[ E = 1.93 \times 10^5 \text{ N/C} \]

Charge of a sheet: \( E = \frac{\sigma}{2 \varepsilon_0} = 2\pi \cdot k \cdot \sigma \)

\[ \sigma = 3.4 \times 10^{-6} \text{ C/m}^2 \]

Insulator Sheet: \( + \quad + \quad + \quad + \quad \)

Metal Surface: \( + \quad + \quad + \quad + \quad \)

\[ E = \sigma \varepsilon_0 \]

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Magnets

Magnetic Field - Flow of Mag Flux.
  Mag Flux circulates.
  Mag Field lines form loops.

Effects of magnets:
  • Attract / Repel
  • Can magnetize materials
  • Compass
  • Motors
  • Generators

Magnetic Force
\[ F = q \mathbf{v} \times \mathbf{B} \]

\[ |F| = |q| |\mathbf{v}| |\mathbf{B}| \sin \theta \]

\[ \mathbf{v} \text{ and } \mathbf{B} \text{ can't be parallel} \]

\[ = q \mathbf{v} \perp \mathbf{B} = q \mathbf{v} \mathbf{B} \perp \]

\[ \mathbf{B} \rightarrow \nabla \mathbf{B} \quad \theta \rightarrow \mathbf{v} \]

\[ \mathbf{F} = q \mathbf{v} \mathbf{B} \quad \mathbf{F} = \mathbf{0} \]

\[ \mathbf{F}_B \text{ is } \perp \text{ to both } \mathbf{v} \text{ and } \mathbf{B} \]
Specifying Directions

Terms: $+x$, $-x$, $+y$, $-y$, $+z$, $-z$

Paper Space: Front (F), Back (B), Right (R), Left (L), Top (T), Bottom (B), Out (O), In (I), Up (U), Down (D)

Relative: E, W, N, S, U, D

Model Space: E, W, N, S, U, D