Development towards an electromagnetic and circuit theory concept inventory of undergraduate engineering students

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Students making common mistakes in exams

By cataloguing mistakes from past exam scripts

First year physics and engineering students

Why

How

Whom

Student Gaussian Surfaces

Electromagnetic Concepts

Ampere

\[ \oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 I_{\text{enc}} \]

Faraday

\[ \oint \mathbf{E} \cdot d\mathbf{A} = \frac{q}{\varepsilon_0} \]

Kirchhoff

\[ \frac{dI}{dt} = \frac{\varepsilon}{\text{RC}} \]

Gauss

\[ \oint \mathbf{E} \cdot d\mathbf{A} = \frac{q_{\text{enc}}}{\varepsilon_0} \]

Student Misconceptions

- Used current in a capacitor
- Neglected area of loop
- Used Biot-Savart law
- Thought emf was current
- Only used one parallel side of Ampere's loop instead of two
- Used force on a current carrying wire

Exam Questions

Proposed Questions

1. Coulomb's Law

2. Electric Flux

3. Charge and energy

Exam Questions

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