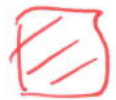


1.

Spennudeiling

$$V_2 = \frac{R_2}{R_1 + R_2} \cdot V_1 = \frac{15k}{5k + 15k} \cdot 10V$$

$$= \frac{3}{4} \cdot 10V = 7.5V$$



2. Spennir

Við höfum

$$N_1 i_1 = N_2 i_2$$

svo

$$\tilde{i}_2 = \frac{N_1}{N_2} i_1 = \frac{100}{5} \times i_1 = 20 i_1$$

og aflid er varðveitt svo

$$i_1 V_1 = \tilde{i}_2 V_2$$

og þá

$$V_2 = \frac{\tilde{i}_1}{\tilde{i}_2} V_1 = \frac{V_1}{20}$$



3.

Raffaedi

$$\Phi_E = \frac{q}{\epsilon_0} = \frac{100 \times 10^6 \times 1.6022 \times 10^{-19} \text{ C}}{8.854 \times 10^{-12} \text{ F/m}}$$

$$= 1.81 \frac{\text{Nm}^2}{\text{C}}$$



4. Linuhledsla og rafsvið

(a)

$$dE = \frac{k dq}{L^2 + y^2}$$

Svo

$$dE_x = \frac{k \lambda dy}{(L^2 + y^2)^{3/2}} L$$

og

$$dE_y = \frac{k \lambda dy y}{(L^2 + y^2)^{3/2}}$$

(b)

$$E_x = \int_{-L}^L dE_x = \int_{-L/2}^{L/2} \frac{k \lambda dy}{(L^2 + y^2)^{3/2}} = k \lambda \left[\frac{y}{L^2 \sqrt{L^2 + y^2}} \right]_{-L/2}^{L/2}$$

og

$$E_y = 0 \quad (\text{vegna samhverfu})$$



5.

Segullkraftur og vægi

(a) $F_{ca} = 0$ (samsíða \underline{B})

$$F_{ab} = I \underline{l} \times \underline{B} = I \cdot 2\sqrt{2} \times 0.6T \cdot \sin 45^\circ$$
$$= 2.04 \text{ N} \quad (\text{upp}) \quad (\text{út úr blaði})$$

$$F_{cb} = I \underline{l} \times \underline{B} = I \cdot 2 \times 0.6 \times \sin 90^\circ$$
$$= 2.04 \text{ N} \quad (\text{niður}) \quad (\text{inn í blaði})$$

(b) $\underline{\mu} = I \cdot \underline{A}$ upp

þar sem

$$|\underline{A}| = \frac{1}{2} \cdot 2 \cdot 2 = 2 \text{ m}^2$$

SVO

$$\underline{\mu} = 1.7 \text{ A} \times 2 \text{ m}^2 = 3.4 \text{ A m}^2 \text{ upp}$$

(út úr blaði)

(c)

$$\underline{\tau} = \underline{\mu} \times \underline{B} = 3.4 \text{ A m}^2 \times 0.6 \text{ T} \times \sin 90^\circ$$

$$= 2.04 \text{ Nm} \quad (\text{til vinstri})$$

7. Færslustráumur

(a) Samband hleðslu og spennu yfir þétti er $q = CV$. Fyrir plötuþétti er

$$C = \frac{\epsilon_0 A}{s}$$

þar sem s er fjarlægð á milli plötur. Rafsvið á milli plötunnanna er einsleitt svo $V = Es$ og því

$$q = CV = CEs = \frac{\epsilon_0 A}{s} Es = \epsilon_0 AE$$

Við finnum tímaafleiðuna

$$\frac{dq}{dt} = I = \epsilon_0 A \frac{dE}{dt}$$

og færslustráumurinn þá

$$i_d = \epsilon_0 \frac{d\Phi_E}{dt} = \epsilon_0 \frac{d(E \cdot A)}{dt} = \epsilon_0 A \frac{dE}{dt} = I$$

7. fch

b) Nú er

$$\frac{dE}{dt} = \frac{I}{\epsilon_0 A} = \frac{2}{8.854 \times 10^{-12} \times 1^2} = 2.3 \times 10^{11} \text{ V/ms}$$

c) þar sem rafsviðið inna þéttisins er einsleitt er hlutfallið i_d/A fasti svo

$$i_{\text{denc}} = \frac{A_{\text{enc}}}{A_{\text{tot}}} \cdot i_d = \frac{d^2}{L^2} i_d = \frac{0.5^2}{1^2} 2 = 0.5 \text{ A}$$

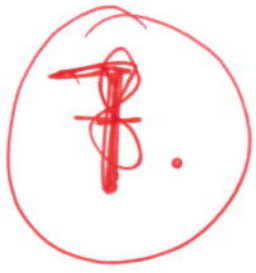
d) Högmál Ampére segir

$$\oint \underline{B} \cdot d\underline{s} = \mu_0 i_d$$

eda

$$\oint \underline{B} \cdot d\underline{s} = \mu_0 i_d = 4\pi \times 10^{-7} \times 0.5 = 6.3 \times 10^{-7} \text{ Tm}$$





Langspóla

$$B = \mu_0 n I = \mu_0 \frac{N}{L} I$$

SVO

$$B_1 = \mu_0 \frac{N}{R_1} I$$

og því

$$B_1 = \cancel{\mu_0} \frac{N}{R_1} \cdot \frac{B_2 R_2}{\cancel{\mu_0} N} = \frac{R_2}{R_1} B_2$$

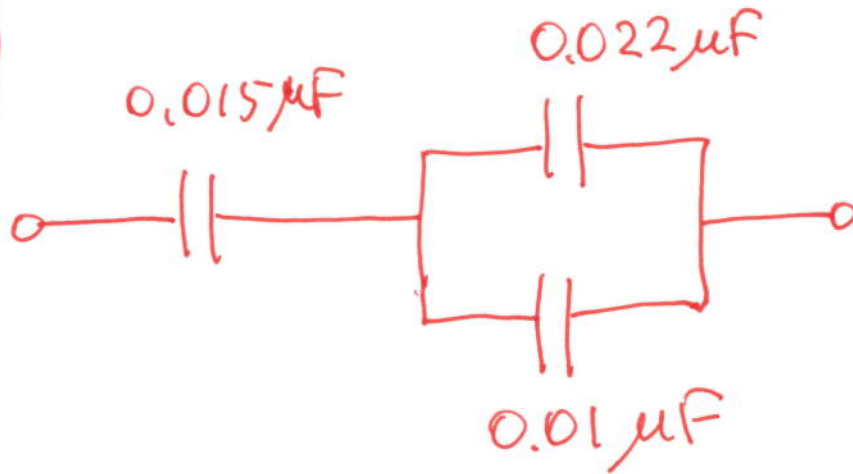
$$= \frac{21}{18} \cdot B_2$$

SVO

$$B_2 = \frac{18}{21} \cdot B_1 = \frac{18}{21} 2.0 \text{ mT} = 1.7 \text{ mT}$$



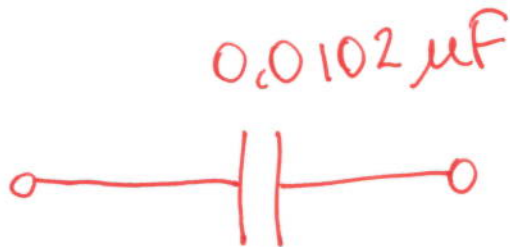
8.



eda



og



$$\frac{0.015 \times 0.032}{0.015 + 0.032} = \frac{4.8 \times 10^{-4} \mu\text{F}^2}{0.047 \mu\text{F}}$$

$$= 0.0102 \mu\text{F}$$



9.

E

Heildar sviðid er hvergi
núll í nálægð við
tvo samsíða straumbeirni
víra.

10.

Ljuktja i ytra segulsvidi

(a) samsíða
náll

(b) hornrétt

$$\Phi_B = BA = 0,2 \text{ T} \times (0,1 \text{ m})^2 \hat{n}$$

$$= 6,283 \text{ mTm}^2 = 6,283 \text{ mWb}$$

(c) undir 30° horni

$$\Phi_B = BA \cos \phi = 0,2 \times (0,1 \text{ m})^2 \hat{n} \cos 60^\circ$$

$$= 3,14 \text{ mTm}^2 = 3,14 \text{ mWb}$$

