Dæmi 1, (11-11-60)

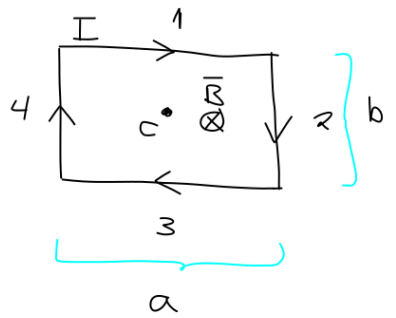
$$\bar{B} = (B_x, 0, B_z) = (0{,}5, 0{,}0, 0{,}8)\,T$$

$$\bar{v} = (v_x, v_y, 0) = (3{,}0, 4{,}0, 0{,}0)\cdot 10^6\ m/s$$

finna $\bar{F} = q\,\bar{v} \times \bar{B}$

$$\bar{F} = q\begin{vmatrix} i & j & k \\ v_x & v_y & 0 \\ B_x & 0 & B_z \end{vmatrix} = q\left(v_y B_z, -v_x B_z, -B_x v_y\right)$$

Dæmi 2, (11-12-20)



Finna segulsviðið í punktinum C í miðri lykkjunni $\bar{B}_C$

Hægrihandarreglan gefur okkur að segulsviðið í C er inn í síðuna og

$\bar{B}_4 = \bar{B}_2$, $\bar{B}_1 = \bar{B}_3$ í C

Ég nota jöfnur (12.5-6) með nauðsynlegri aðlögun

$$B_3 = \frac{\mu_0 I}{2\pi}\int_0^{a/2} \frac{R\,dx}{(x^2+R^2)^{3/2}}, \quad R = \frac{b}{2}$$

notandi

$$\int \frac{dx}{(x^2+R^2)^{3/2}} = \frac{x}{R^2(x^2+R^2)^{1/2}} + C$$

$$B_3 = \frac{\mu_0 I R}{2\pi}\,\frac{a\sqrt{4R^2+a^2}}{4R^4+a^2R^2} = \frac{\mu_0 I}{\pi b}\,\frac{1}{\sqrt{1+\left(\frac{b}{a}\right)^2}}$$

og á svipaðan hátt

$$B_4 = \frac{\mu_0 I}{\pi a}\,\frac{1}{\sqrt{1+\left(\frac{a}{b}\right)^2}}$$

$$B_{Total} = \frac{2\mu_0 I}{\pi b}\,\frac{1}{\sqrt{1+\left(\frac{b}{a}\right)^2}} + \frac{2\mu_0 I}{\pi a}\,\frac{1}{\sqrt{1+\left(\frac{a}{b}\right)^2}}$$

$$= \frac{2\mu_0 I}{\pi ab}\sqrt{a^2+b^2}$$

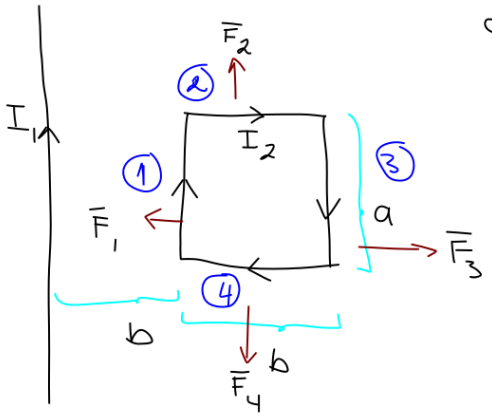
Dæmi 3, (11-12-34)

Finna heildarkraftinn á lykkjuna

$$d\bar{F} = I\,d\bar{\ell} \times \bar{B}$$

$$\bar{F}_2 + \bar{F}_4 = 0$$

$$\bar{F}_1 + \bar{F}_3 \neq 0$$



Á leiðurum 1 og 3 er segulsvið vegna I_1 fast

(5)

$$F_1 = I_2\, a\, \frac{\mu_0 I_1}{2\pi b}$$

$$F_3 = I_2\, a\, \frac{\mu_0 I_1}{2\pi\, 2b} \quad \rightarrow \quad F_1 > F_3$$

$$F_1 - F_3 = \frac{\mu_0 I_1 I_2 a}{2\pi}\left(\frac{1}{b} - \frac{1}{2b}\right)$$

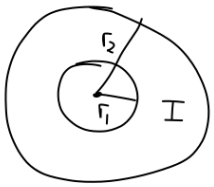
$$= \frac{\mu_0 I_1 I_2}{4\pi}\left(\frac{a}{b}\right)$$

$$\rightarrow \quad \overline{F}_{total} = -\frac{\mu_0 I_1 I_2}{4\pi}\left(\frac{a}{b}\right)\hat{i}$$

með stefnu að beina vírnum með I_1

(6)

Dæmi 4, (11-12-46)



$$\oint \overline{B} \cdot d\overline{l} = \mu_0 I$$

Fyrir $r < r_1$ $\quad I_{enc} = 0 \rightarrow \quad \overline{B} = 0$

Fyrir $r > r_2$

$$2\pi r B = \mu_0 I$$

$$\overline{B}(r) = \frac{\mu_0 I}{2\pi r}\hat{\theta}$$

(7)

Fyrir $r_1 < r < r_2$

$$I_{enc(H)} = I\left(\frac{r^2 - r_1^2}{r_2^2 - r_1^2}\right)$$

$$\rightarrow \quad 2\pi r B = \mu I\left(\frac{r^2 - r_1^2}{r_2^2 - r_1^2}\right)$$

$$\rightarrow \quad \overline{B}(r) = \frac{\mu_0 I}{2\pi r}\left(\frac{r^2 - r_1^2}{r_2^2 - r_1^2}\right)\hat{\theta}$$