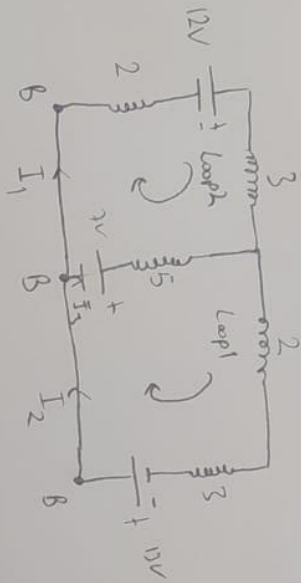


Q1)
a)



For loop 1:

$$\Delta \xi = 13 + 5I_3 + 2 - 2I_2 - 3I_2 = 0 \quad 5I_3 - 5I_2 = -20$$

For loop 2:

$$\Delta \xi = -5I_3 - 2 - 2I_1 + 12 - 3I_1 = 0 \quad 5I_3 + 5I_1 = 5$$

$$I_2 + I_3 = I_1$$

$$5I_3 - 5I_2 = -20$$

$$10I_3 + 5I_2 = 5$$

$$15I_3 = -15A$$

$$I_3 = -1A$$

$$I_2 = 3A$$

$$I_2 + I_3 = I_1 = 2A$$

The direction of I_3 is wrong.

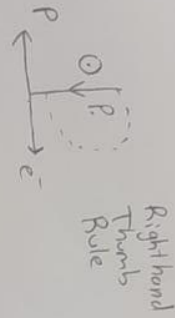
$$A \rightarrow B$$

b)

$$V_a - V_b = 12 - 2 \cdot I_1 = 8V$$



Q2)



a) $F = qV B \sin \theta$ $\theta = 90^\circ$

$V = \frac{|F|}{e|B|} = \frac{3.20 \times 10^{-15}}{(1.6 \times 10^{-19}) \times (4 \times 10^{-3})} = 5 \times 10^6 \text{ m/s}$

b) $F = \frac{mV^2}{r} = \frac{qB}{\gamma} \Rightarrow \gamma = \frac{mV}{qB} = \frac{(9.11 \times 10^{-31}) (5 \times 10^6)}{(1.6 \times 10^{-19}) (4 \times 10^{-3})} \rightarrow \gamma = 582 \times 10^{-3}$

c) $T = \frac{2\pi \cdot r}{V}$ $T = \frac{2 \times 3.14 \times 3.11 \times 10^{-3}}{5 \times 10^6}$

$T = 8.93 \times 10^{-9} \text{ s}$

$T = \frac{1}{f}$ $f = \frac{1}{T}$

$f = 0.1119 \times 10^9 \text{ s}^{-1}$

TC
DOKUZ EYLÜL ÜNİVERSİTESİ
DOKUZ EYLÜL UNIVERSITY
ÖĞRENCİ BİLGİ KARTI

Adı: KEREM
Soyadı: KALINTAS
Öğrenci No: 2022310127
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Q3)

A)



$$\begin{aligned}\vec{B}_1 &= \frac{\mu_0 \cdot I}{4b} \quad (\text{out of page}) + \\ \vec{B}_2 &= \frac{\mu_0 \cdot I}{4a} \quad (\text{out of page}) + \\ \vec{B}_{\text{Total}} &= \vec{B}_1 + \vec{B}_2 = \frac{\mu_0 \cdot I}{4} \left(\frac{1}{a} + \frac{1}{b} \right)\end{aligned}$$

B)

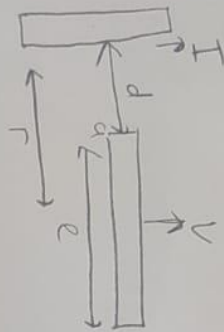


$$\begin{aligned}\oint B \, ds &= \mu_0 I_{\text{enc}} \\ B \cdot 2\pi r &= \mu_0 \cdot I \left(\frac{\pi r^2}{\pi R^2} \right) \\ \begin{cases} r < R \\ r \geq R \end{cases} \quad \begin{cases} B = \frac{\mu_0 \cdot I \cdot r}{2\pi \cdot R^2} \\ B = \frac{\mu_0 \cdot I \cdot R}{2\pi \cdot R^2} \end{cases} \quad \text{out } r=R\end{aligned}$$

B is maximum when $r=R$



Q4)



$$l = d \cdot r$$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$F = -Bvl$$

$$dE = -Bvdr$$

$$\int_a^b d\epsilon = - \int_d^{d+l} B \cdot v \cdot dr$$

v_{ba}

$$v_{ba} = \frac{-\mu_0 I \cdot v}{2\pi} \int_d^{d+l} \frac{1}{r} \rightarrow \frac{-\mu_0 I \cdot v}{2\pi} \cdot \ln(r) \Big|_d^{d+l}$$

$$v_{ba} = \frac{-\mu_0 I \cdot v}{2\pi} \cdot (\ln(d+l) - \ln(d)) \text{ m/s}$$

(left direction)

