AB CDEFGH
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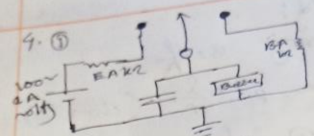
4. (i)



$BA = 7\times1$
$= 7\ k\Omega$
$EA = 5\times1$
$= 5\ k\Omega$
$CA = 3\times1$
$= 3\ V$

Switch at position 1
we know,
$T = R\times C$
$= EA\times C$
$= 5\times10^{3}\times20\times10^{-6}$
$= 0.1$

$E = 3V$

$v_C = E(1-e^{-t/T})$
$\Rightarrow$ ~~$8V = 3(1-e^{-t/0.1})$~~
$\Rightarrow 8V = 3(1-e^{-t/0.1})$
$\Rightarrow 1-e^{-t/0.1} = 2.66$
$\Rightarrow -e^{-t/0.1} = 1.6$
$\Rightarrow e^{-t/0.1} = -1.6$
$\Rightarrow$ ~~[illegible]~~
$\Rightarrow t = 0.032$

~~3 [illegible] 0.032~~
~~= 3.032~~

$\therefore$ At 3 pm the alarm will be buzzing.

Magnetic field:
Flux density, $B = \frac{\phi}{A}$
Reluctance, $R = \rho\frac{l}{A}$ (ohm, Ω)
$R = \frac{l}{\mu A}$
ohms law magnetic circuits,
Effect = $\frac{\text{~~emf~~}}{\text{opposition}}$
$\phi = \frac{F}{R}$
~~F~~ = $F = NI$

magnetizing force (H)

The magnetomotive force per unit length is called the magnetizing force (H)

$H = \frac{F}{l}$

$H = \frac{NI}{l}$

magnetizing force

$B = \mu H$

Flux density $B = \frac{\Phi}{A}$

A B C D E F G H
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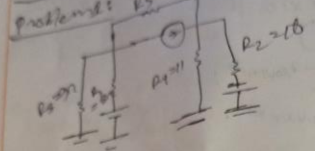
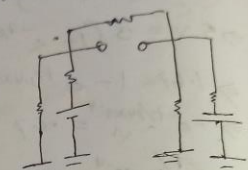
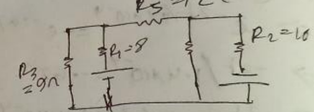
Problem 2: $R_5 = 12\Omega$





$R_1 = A + B$
$= 1 + 7 = 8\Omega$

$R_2 = (B + C)$
$= 7 + 3$
$= 10\Omega$



$R_3 = C + D + H$
$= 3 + 4 + 2 = 9\Omega$

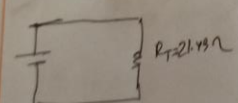
$R_4 = D + E + H$
$= 4 + 5 + 2$
$= 4\Omega$

$R_5 = E + F + H$
$= 12\Omega$

$\frac{1}{R_{P_1}} = \frac{1}{R_1} + \frac{1}{R_3}$

$\Rightarrow \frac{1}{R_{P_1}} = \frac{1}{9} + \frac{1}{8}$

$\Rightarrow R_{P_2} = 4.2\Omega$



$\frac{1}{R_{P_2}} = \frac{1}{R_4} + \frac{1}{R_2} = \frac{1}{11} + \frac{1}{10}$
$= 5.23$

$R_T = 4.2\Omega + 5.23\Omega + 12\Omega$
$= 21.43\Omega$

(11) we know,

$\tau = R \times C = 13A \times C$
$= 7 \times 20 \times 10^{-6}$
$= 1.4 \times 10^{-4}$

$V_C = E(1 - e^{-t/\tau})$

$\Rightarrow 5V = 3(1 - e^{-t/1.4\times10^{-4}})$

$\Rightarrow 1.67 = 1 - e^{-t/1.4\times10^{-4}}$

$\Rightarrow -e^{-t/1.4\times10^{-4}} = .67$

$\Rightarrow e^{-t/1.4\times10^{-4}} = -.67$

$\Rightarrow e^{-2t/1.4\times10^{-4}} = e^{-.67}$

$\Rightarrow -2t/1.4\times10^{-4} = -.67$

$\Rightarrow -2t = -.67 \times 1.4 \times 10^{-4}$

$\Rightarrow -2t = -9.38 \times 10^{-5}$

$\Rightarrow t = 4.69 \times 10^{-5}$

$\therefore$ After 5 mins of ringing, the alarm will stop.

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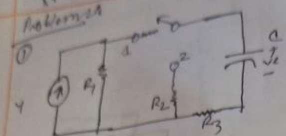
A B C D E F G H
1 7 - 3 4 5 5 4 - 2

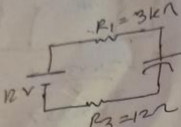
Problem-01

①



$R_1 = A + H$
$= 1 + 2$
$= 3\Omega$

$R_2 = C + H$
$= 3 + 2$
$= 5$



$R_3 = C + F + G$
$= 3 + 5 + 4$
$= 12\Omega$

given,
$t = 0$

$C = C + D + E$
$= 3 + 4 + 5$
$= 12$

$\tau = RC$
$= 15 \times 12 = 180m$

$v_c = E(1 - e^{-t/\tau})$
$= 12(1 - e^{0})$
$= 0$

$i_c = \frac{E}{R_T} e^{-t/\tau}$
$= \frac{12V}{15} e^{0}$
$\cancel{= 0.08}$

$= 0.8$

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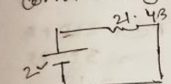
$V = IR$
$\Rightarrow I = \frac{V}{R} = \frac{10V}{21.43\Omega}$
$= 0.46A$

②

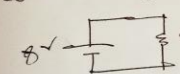
$I_2 = \frac{21.43 \times 2}{8} A$
$= 5.357$

Considering 2v on E1:



$\therefore I_2'' = \frac{2}{17.93} = 0.415 A$

Considering 8v on E2:



$I_3 = \frac{8}{21.43} A$
$= 0.37 A$

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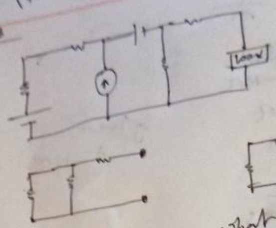
Problem 8:

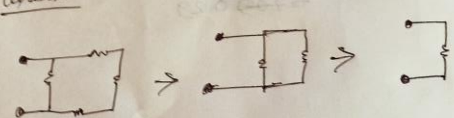


what is R_T ?

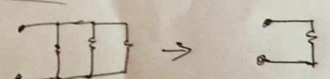
This circuit will get the maximum power,

$R_1 = R_L$

load 1:



For loop 2:



load 3:

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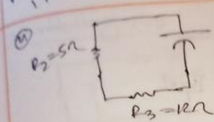
(8)



given,
$t = 120s$

$R_T = 5\Omega + 12\Omega$
$= 17\Omega$

$\tau = RC$
$= 17 \times 12$
$= 204\,ms$

$V_c = E(1 - e^{-t/\tau})$
$= 20(1 - e^{-120/204})$
$= 8.89$

$I_c = \dfrac{V_i \times e^{-t/\tau}}{R_2 + R_3} = \dfrac{8.89}{17} \times e^{-120/204}$

$= \cancel{2.209}\ 0.29$

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3. $I_1 = ?$

$\phi = 1.04 \times 10^{-4}$

Total length $= 2\pi r$

$B = \frac{\phi}{A} = \frac{1.04 \times 10^{-4}\ wb}{1.3 \times 10^{-4}\ m^2} = 0.8\ T$

From graph, where $B = 0.8\ T$

$H = 1000\ At/m$

$\therefore H_g = \frac{B}{4\pi \times 10^{-7}} = \frac{0.8}{4\pi \times 10^{-7}}$

$= 6.36 \times 10^5\ At/m$

So,

$N_1 I_1 + N_2 I_2 = H_g l_g + H l$

$\Rightarrow 200 I_1 + 40 \times 0.3 = 6.36 \times 10^5 \times .002 + 100 \times .3$

$\Rightarrow 200 I_1 + 12 = 6.36 \times 10^5 \times .002 + 30$

$\Rightarrow I_2 = \frac{6.36 \times 10^5 \times .002 + 30 - 12}{200}$

$= 6.45\ A$