Ashika doubt class (21 may 2025)

Wednesday, May 21, 2025 11:02 AM

concept

5) $y = \frac{\alpha^x \beta^y g}{t^z}$

$$\frac{\Delta y}{y} = x\frac{\Delta\alpha}{\alpha} + y\frac{\Delta\beta}{\beta} + z\frac{\Delta t}{t} + \frac{\Delta g}{g}$$ (0)

$r = 0.35 \quad \Delta r = 0.05$

$l = 15, \quad \Delta l = 0.2$

$R = 100, \quad \Delta R = 10$

$R = \frac{\rho l}{A}$

$\rho = \frac{R \cdot A}{l} \qquad A = \pi r^2$

$\rho = \frac{R \cdot \pi r^2}{l}$

$\frac{\Delta\rho}{\rho} \times 100 =$ % error in ρ

$\frac{\Delta R}{R} \times 100 =$ % error in R

$\frac{\Delta\rho}{\rho} = \frac{\Delta R}{R} + 2\frac{\Delta r}{r} + \frac{\Delta l}{l}$

$\frac{\Delta\rho}{\rho} = \frac{10}{100} + 2\frac{0.05}{0.35} + \frac{0.2}{15} = 0.1 + \frac{2}{7} + \frac{2}{150}\frac{1}{75} = 0.1 + 0.28 + 0.01$

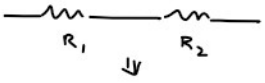
$= 0.39$ (b) Ans

12) $R_1 = R_2 = R_0$

$\alpha_1 \quad \alpha_2$

$R_1 = R_0(1+\alpha_1\Delta T)$

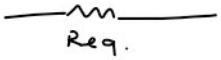
$R_2 = R_0(1+\alpha_2\Delta T)$



$R_{eq} = R_1 + R_2 = R_0(1+\alpha_1\Delta T) + R_0(1+\alpha_2\Delta T) = R_{eq}(1+\alpha_{eq}\Delta T)$ ($2R_0$)

$R_{eq} = R_1 + R_2 = 2R_0$

$R_0\{2 + (\alpha_1+\alpha_2)\Delta T\} = R_0(2 + \alpha_{eq}(2)\Delta T)$



$(\alpha_1+\alpha_2)\Delta T = 2\alpha_{eq}\cdot\Delta T$

$\alpha_{eq} = \frac{\alpha_1+\alpha_2}{2}$

R_1

Parallel

$R_{eq} = \frac{R_0 \times R_0}{2R_0} = \frac{R_0}{2}$

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

$\downarrow \Delta T$

$\frac{1}{R_{eq}(1+\alpha_{eq}\Delta T)} = \frac{1}{R_0(1+\alpha_1\Delta T)} + \frac{1}{R_0(1+\alpha_2\Delta T)}$

$\frac{2}{R_0(1+\alpha_{eq}\Delta T)} = \frac{1}{R_0(1+\alpha_1\Delta T)} + \frac{1}{R_0(1+\alpha_2\Delta T)}$

$2(1+\alpha_{eq}\Delta T)^{-1} = (1+\alpha_1\Delta T)^{-1} + (1+\alpha_2\Delta T)^{-1}$

$(1-\alpha_{eq}\Delta T)$

binomial approximation

$(1+x)^n \approx 1+nx$

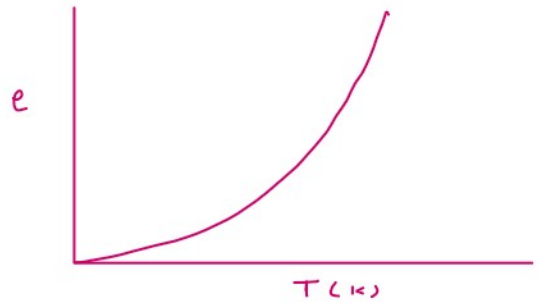
$x <<< 0$

$$\gamma - 2\alpha_{eq}\Delta T = \gamma - \alpha_1 \Delta T + \gamma - \alpha_2 \Delta T$$

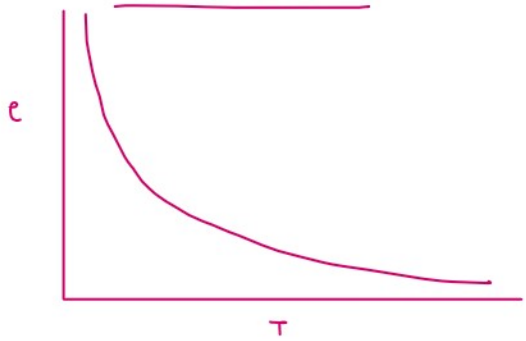
$$\alpha_{eq} = \frac{\alpha_1 + \alpha_2}{2}$$

Resistivity

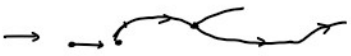
Conductor

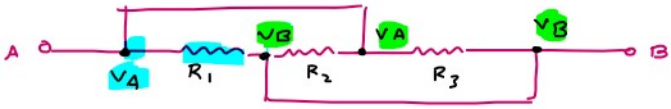


Semiconductor

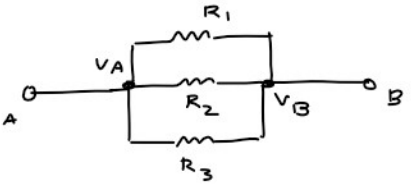


14)

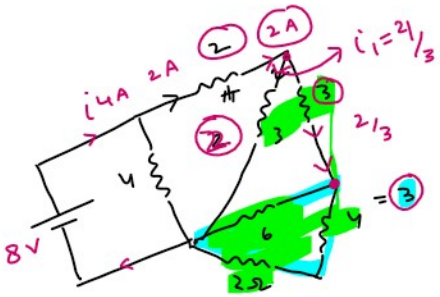




$V_A - V_B = R_1, R_2, R_3$



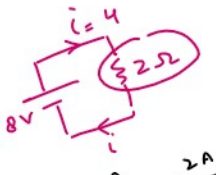
Resistance in parallel have same voltage across them.



4+2 = 6 Ω

$\frac{6\times6}{6+6} = R_{eq} = \frac{6\times\cancel{6}}{\cancel{12}} = 3\,\Omega$

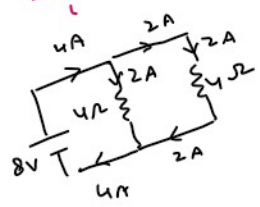
$\frac{6\times3}{6+3} = \frac{6\times\cancel{3}}{\cancel{9}_3} = 2$

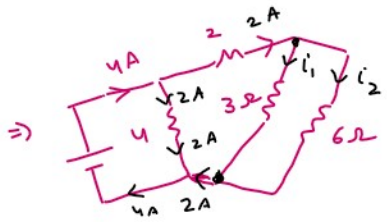


$i = \frac{8}{2} = 4A.$

$\frac{4\times4}{4+4} = \frac{4\times\cancel{4}}{\cancel{8}_2} = 2$

$R_{eq} = 2$





$\Rightarrow$

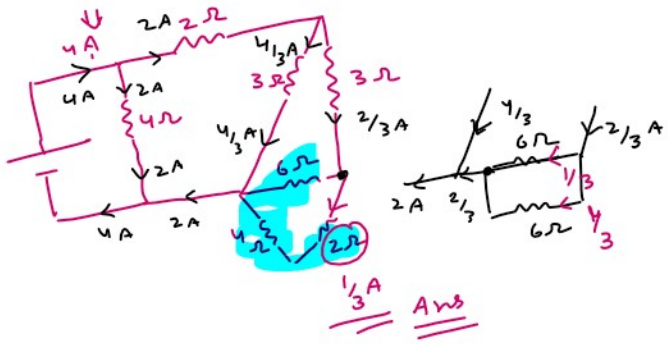
$3i_1 = 6i_2$

$i_1 = 2i_2$

$i_1 + i_2 = 2A$

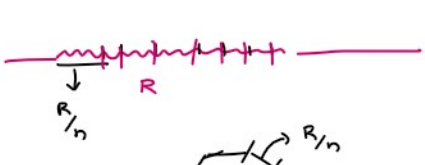
$3i_2 = 2A$

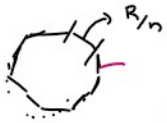
$i_2 = 2/3$ $\quad i_1 = 4/3$



Ans

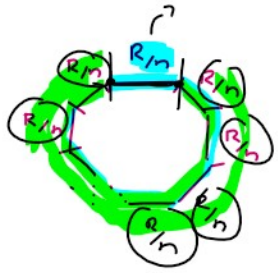
19)

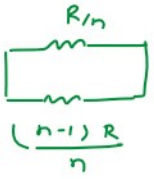




$\frac{(n-1)R}{n}$

$(n-1)\left(\frac{R}{n}\right)$





$\Rightarrow Req = \frac{\frac{R}{n} \times \frac{(n-1)R}{n}}{\frac{R}{n} + \frac{(n-1)R}{n}}$

$= \frac{\frac{(n-1)R}{n}}{n} = \frac{(n-1)R}{n^2}$